

NON-ELECTRIC CONDENSATE PUMPS

PMP Series Pressure Motive Pumps

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TYPICAL APPLICATION

The Watson McDaniel PMP Series of Pressure Motive Pumps are designed to transfer liquids, normally condensate, without the use of electrical energy. The primary application for the PMP is pumping condensate from a process application or condensate collection area back to the return system.

Hot Condensate The mechanical seals in standard electric condensate return pumps begin to have difficulty when handling condensate in excess of 195° F. Seal failure is virtually guaranteed when condensate temperatures reach 203° F due to flashing of the condensate across the seal face. It is therefore required to cool condensate in order to prevent seal failure prior to pumping using electric pumps. PMPs do not have seals and therefore will handle condensate well in excess of these temperatures.

Several choices of pump body materials, types and configurations are available to meet specific customer applications:

Ductile Iron Tanks Ductile Iron is far superior to cast iron in handling higher pressures and temperatures. Ductile iron is also extremely corrosive resistant to condensate and water and can last in excess of 50 years before tank replacement is required. Our ductile iron tanks can be ASME coded on request.

Fabricated Carbon Steel Carbon steel has a higher pressure and temperature rating than ductile iron. Certain industrial facilities such as chemical and petrochemical refineries request carbon steel only. Our carbon steel tanks come standard ASME coded.

Fabricated Stainless Steel Stainless steel (304L) tanks are the most corrosive resistant and can be used in extremely harsh environments.

Low Profile Low profile tanks are often required when draining condensate from process equipment when positioned close to the ground which limits filling head. Low profile units are available in both fabricated steel and cast iron.

Sump Drainers Sump drainers are similar to the standard PMP models except that they discharge the condensate vertically upwards. This piping configuration allows them to be easily fit into below ground sump pits with limited space.

High Pressure Standard units have a maximum discharge pressure of 150 PSIG. High pressure (PMPHP) units can discharge condensate up to 200 PSIG and are used for returning condensate against systems with high back pressure.

TYPICAL CONFIGURATIONS

Stand-Alone: PMP pump unit with inlet and outlet check valves.

Simplex: One Pumping unit with check valves and receiver tank, mounted on frame and skid base.

Duplex: Two Pumping units with check valves and receiver tank, mounted on frame and skid base..

Triplex: Three Pumping units with check valves and receiver tank, mounted on frame and skid base.

Quadraplex: Four Pumping units with check valves and receiver tank, mounted on frame and skid base.

CUSTOM CONFIGURATIONS

Watson McDaniel's fully-qualified fabrication facility is ASME code certified. Our engineers can design and build complete custom systems to meet all your requirements.

FEATURES

- **Seal-less** – The PMP contains no seals. The weak point in conventional electric pumps is seal failure due to flashing hot condensate across the seal face.
- **Non-Electric** – Since no electricity is required they can be used in remote locations or NEMA 4, 7 & 9 hazardous areas. Can operate using steam, air, nitrogen or other pressurized gases as the motive force.
- **Ductile-Iron** – Pump tanks are standard in Ductile-Iron which is far superior to Cast-Iron for pressure and temperature rating and safety. Can be ASME coded and can last in excess of fifty years prior to replacement.
- **Carbon Steel** – Pump tanks available in ASME coded carbon steel.
- **Stainless Steel** – Pump tank options include 304L for applications in harsh environments.

OPTIONS

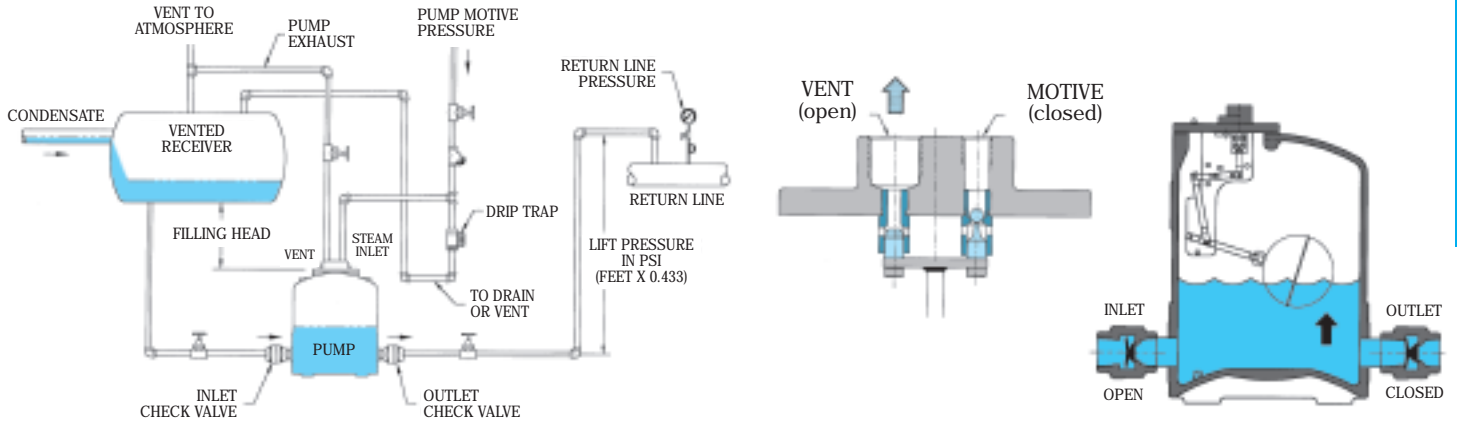
- Cycle counter for measuring the amount of condensate flow through the pump.
- Insulation jackets are available to stop radiation losses through the pump body and provide personal protection.
- Sight glass for monitoring liquid level inside pump body.
- ASME code-certified fabrication facility for the design and manufacture of customized systems.

NON-ELECTRIC CONDENSATE PUMPS

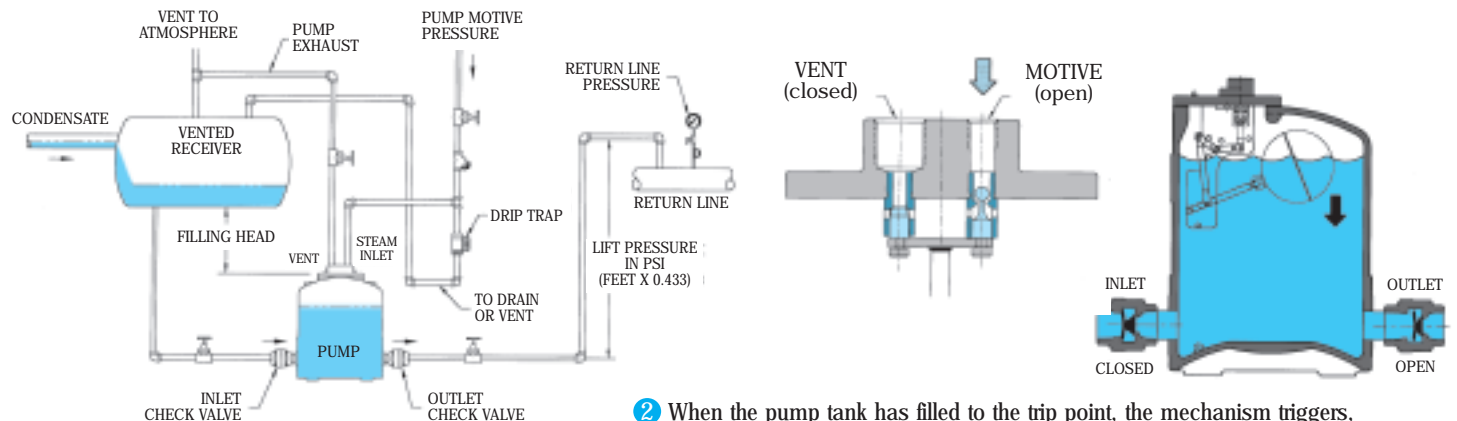
PMP Series Pressure Motive Pumps

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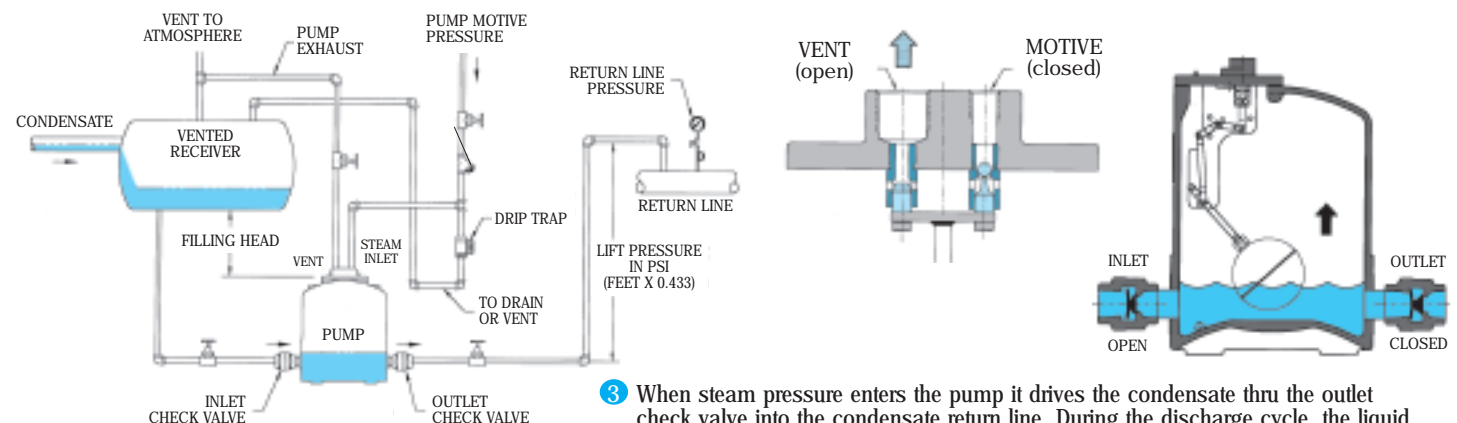
Function of PMP Pressure Motive Pump



- 1 Condensate flows from the receiver tank thru the inlet check valve and fills the pump tank. During the filling cycle the float inside the tank rises.



- 2 When the pump tank has filled to the trip point, the mechanism triggers, opening the steam inlet valve and simultaneously closing the vent valve. This allows motive pressure to enter the pump body.



- 3 When steam pressure enters the pump it drives the condensate thru the outlet check valve into the condensate return line. During the discharge cycle, the liquid and the float inside the pump tank drops. At the lower trip point, the mechanism triggers and the steam inlet valve to the pump tank closes and simultaneously the vent valve opens. The fill and discharge cycle then repeats itself.

NON-ELECTRIC CONDENSATE PUMPS

PMP Series Pressure Motive Pumps

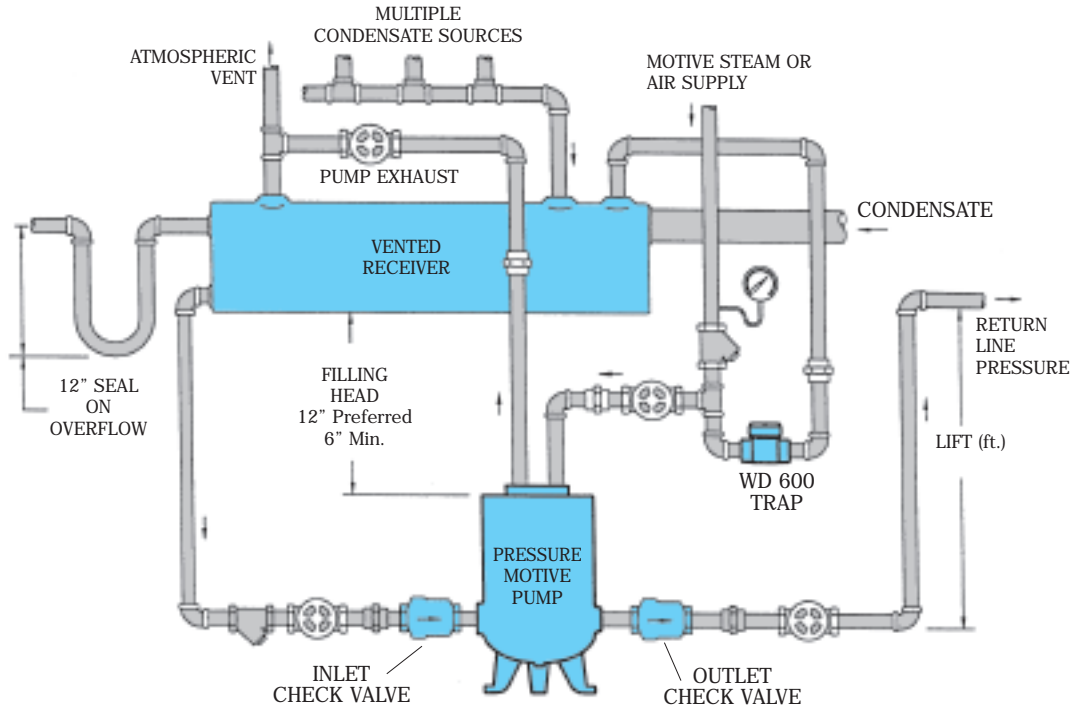
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Open Loop System (Vented Receiver)

TYPICAL INSTALLATIONS

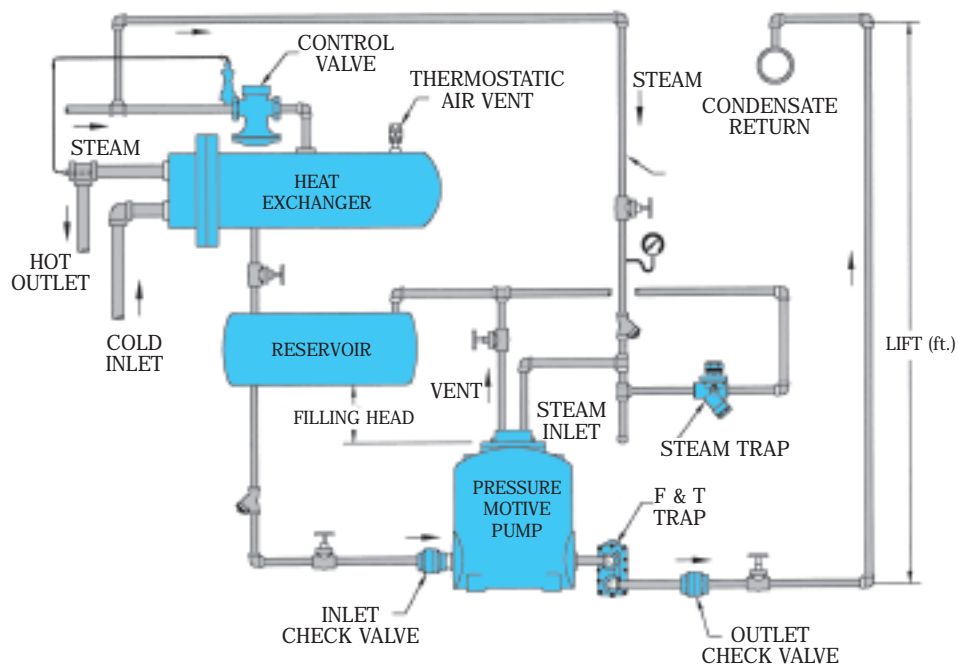
When utilizing a PMP Series Pump in an "open-loop" system a receiver tank that is vented to atmosphere must be installed above the pump to provide enough hydraulic head to move the condensate into the pump since it has lost all its pressure to atmosphere along with the flash steam. This is particularly necessary when there are multiple condensate sources at very different pressures dumping into a common receiver. The receiver vented to atmosphere equalizes the discharge pressure of all the steam traps thus preventing a trap operating at higher pressure from stalling a trap operating at a lower pressure.



Closed Loop System (Pressurized Reservoir)

TYPICAL INSTALLATIONS

When utilizing a PMP Series Pump in a "closed-loop" system a reservoir tank that is not vented to atmosphere must be installed above the pump to provide a hydraulic head and a holding area for the condensate when the pump is in its discharge cycle. The "closed-loop" system is used to drain a single piece of heat-transfer equipment where the venting of flash steam is not desired or when the condensate return pressure exceeds the steam pressure inside the equipment. This causes the common steam trap system to stall and back condensate up into the equipment.



NON-ELECTRIC CONDENSATE PUMPS

PMP Series

Pressure Motive Pumps

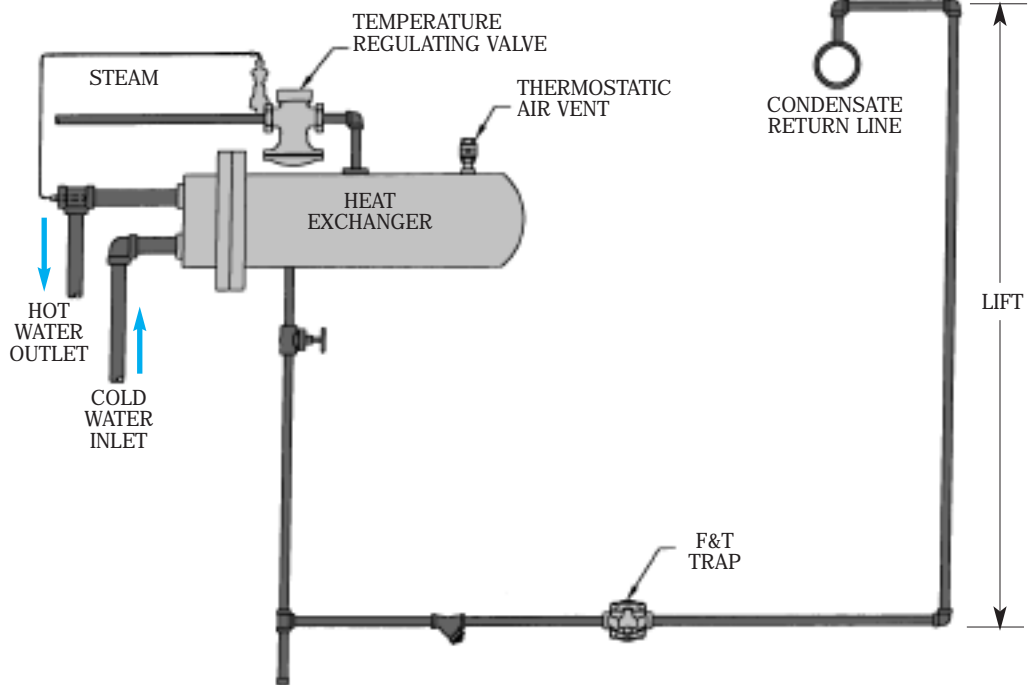
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Problem: Stalled Heat Exchanger

DESCRIPTION

STALL CONDITION WITH MODULATED STEAM FLOW.

Steam flowing into the heat exchanger is controlled by the temperature regulating valve. When the temperature regulating valve is fully open, any condensate forming inside the heat exchangers will be pushed through the steam trap into the condensate return line. When the temperature regulating valve partially or fully closes the steam pressure inside the heat exchangers can no longer overcome the back pressures and the condensate will build up in the heat exchanger. This condition is called system stall and results in water hammer and poor heat transfer due to the condensate build-up in the heat exchanger.



PUMPS

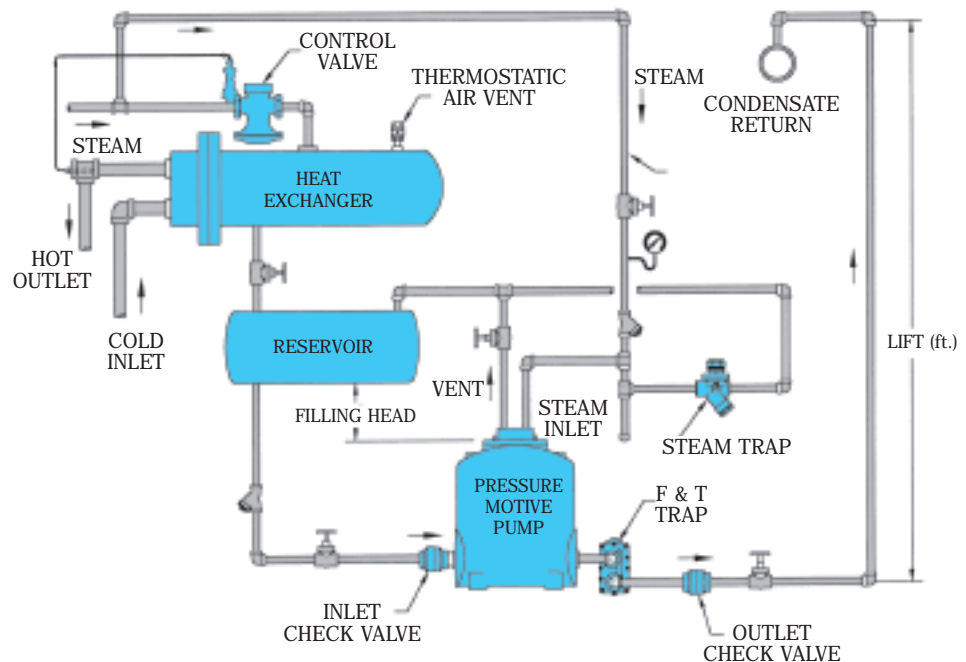
Solution:

DESCRIPTION:

USE A PRESSURE MOTIVE PUMP AS SHOWN

When the temperature regulating valve is fully open, any condensate forming inside the heat exchangers will be pushed through the pump and steam trap into condensate return line. When the temperature regulating valve closes, any condensate forming inside the heat exchanger will drain by gravity into the pump tank. When the level inside the pump tank reaches the trip point, high pressure steam will drive the condensate from the tank into the condensate return line.

Note: A larger steam trap than normally required to drain the heat exchanger must be used to handle the high instantaneous discharge rate of the pump.



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PMP Series Pressure Motive Pumps

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The following models of the PMP Series all have identical internal mechanisms. The only difference between each model is the body and cover material.

PMPC



DUCTILE IRON

PMPF



CARBON STEEL

PMPSS



STAINLESS STEEL

PMPLS



LOW PROFILE

PMPSP



CARBON STEEL
SUMP DRAINER

TYPICAL APPLICATIONS

The Watson McDaniel PMP Series Pressure Motive Pumps are designed to transfer liquids (usually hot condensate) without the use of electrical energy. The primary application for the PMP is pumping condensate from a process application or condensate collection area back to the return system.

PUMP FEATURES

- **Seal-less** – The PMP contains no seals. The weak point in conventional electric pumps is seal failure due to flashing hot condensate across the seal face.
- **Non-Electric** – Since no electricity is required they can be used in remote locations or NEMA 4, 7 & 9 hazardous areas. Can operate using steam, air, nitrogen or other pressurized gases as the motive force.
- **Ductile-Iron** – Pump tanks are standard in Ductile-Iron which is far superior to Cast-Iron for pressure and temperature rating and safety. Can be ASME coded and can last in excess of fifty years prior to replacement.
- **Carbon Steel** – Pumps tanks available in ASME coded carbon steel.
- **Stainless Steel** – Pumps tank options include 304L for applications in harsh environments.

PMPC

The Model PMPC pressure motive pump body & cover are manufactured from ductile iron. ASME “UM” code stamp available.

PMPF

The Model PMPF pressure motive pump is designed for high pressure applications. Pump body & cover are manufactured from carbon steel and receive the ASME “UM” code stamp.

PMPSS

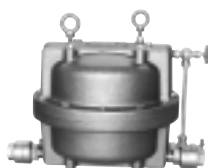
The Model PMPSS pressure motive pump body & cover are manufactured from 304L stainless steel. These tanks are designed to be used in harsh corrosive environments and receive the ASME “UM” code stamp.

PMPLS

The Model PMPLS pressure motive pumps are low profile. These tanks are often required when draining condensate from process equipment positioned close to the ground which limits the filling head of the pump. Pump body & cover are manufactured from carbon steel and receive the ASME “UM” code stamp.

PMPSP

The Model PMPSP sump drainer body & cover are manufactured from carbon steel. These tanks are fabricated with 1/8” corrosion allowance and receive the ASME “UM” code stamp. The Model PMPSP Sump Drainer is designed for pumping out and draining pits.



LOW PROFILE

PMPM

The Model PMPM pressure motive pump has an extremely low-profile. These low-profile tanks are required when draining condensate from process equipment positioned close to the ground which limits the filling head of the pump.

NON-ELECTRIC CONDENSATE PUMPS

PMP Series

Pressure Motive Pump Internal Mechanism

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ALL STAINLESS STEEL INTERNALS

Patented SNAP-ASSURE™ Feature
Guaranteed to extend pump life even in the most demanding applications.

INLET AND VENT VALVES
Made from heat-treated 17-4 stainless steel. Adds durability for extended life.

PINS AND WEAR POINTS
Pivot pins and wear points are made from heat-treated stainless steel with a heavy layer of hard chrome plating.

INCONEL-X-750 DUAL COMPRESSION SPRINGS
Springs were designed to minimize stresses and last indefinitely.

PUMPS

INTERNAL MECHANISM FEATURES

- Equipped with our Patented “Snap-Assure” feature, found only on Watson McDaniel’s mechanisms. “Snap-Assure” extends the useful life of the pump by assuring the internal toggle action to trigger (snap) at every cycle.
- All Stainless Steel components eliminate corrosion and rusting
- Hard chrome-plated pivot pins and wear points substantially reduce the rate of wear on critical components
- 17-4 heat-treated stainless steel inlet and vent valve. Hardened seats have proven themselves to last years longer in service.
- Dual compression springs made from Inconel-X-750 minimize stress and corrosion and are made to last indefinitely
- Precision manufactured mechanisms never require field adjustments
- Watson McDaniel “Snap-Assure” mechanisms can be purchased separately and will fit other manufacturer’s pump tanks

INTERNAL MECHANISM MATERIALS

Cover	Material for cover same as tank material
Cover Gasket	Garlock / Grafoil
Cover Bolts	Grade B5
Inlet Valve	Hardened Stainless Steel, Rc 40
Vent Valve	Hardened Stainless Steel, Rc 40
Mechanism Yoke	304 Stainless Steel
Ball Float	Stainless Steel
Springs	Inconel-X-750
Other Internal Parts	Stainless Steel

Snap-Assure Patent No. 6572340

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PUMPS

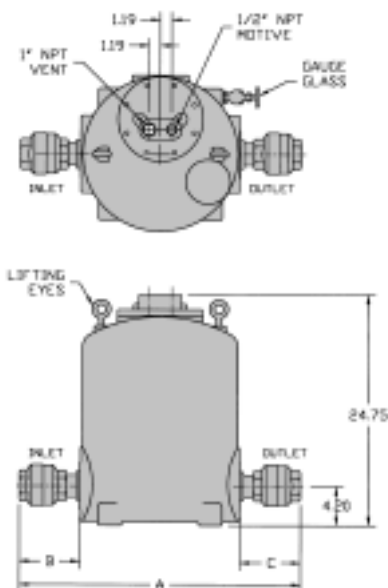
PMPC



Model	PMPC
Body	Ductile Iron
Cover	Ductile Iron
Check Valves	Stainless Steel
PMO Max. Operating Pressure	200 PSIG
TMO Max. Operating Temperature	388°F
PMA Max. Allowable Pressure	200 PSIG @ 650°F

DESCRIPTION

The Model PMPC pressure motive pump body & cover is manufactured from ductile iron. ASME "UM" code stamp available.



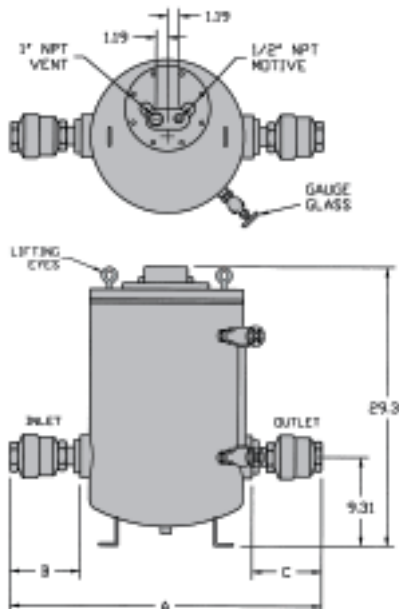
PMPF



Model	PMPF
Body	Carbon Steel
Cover	Carbon Steel
Check Valves	Stainless Steel
PMO Max. Operating Pressure	200 PSIG
TMO Max. Operating Temperature	388°F
PMA Max. Allowable Pressure	250 PSIG @ 650°F

DESCRIPTION

The Model PMPF pressure motive pump is designed for high pressure applications. Pump body & cover are manufactured from carbon steel and receive the ASME "UM" code stamp.



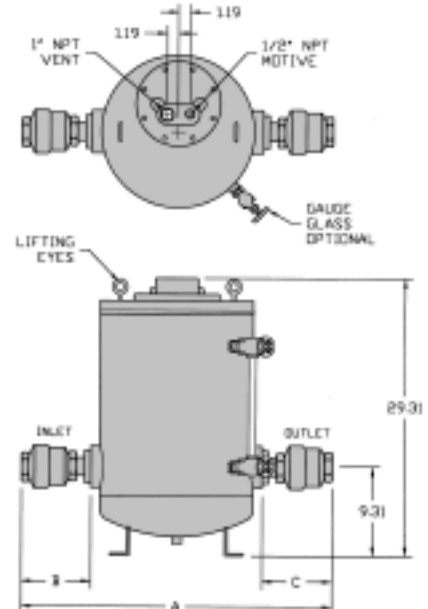
PMPSS



Model	PMPSS
Body	304L SS
Cover	304L SS
Check Valves	Stainless Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 650°F

DESCRIPTION

The Model PMPSS pressure motive pump body & cover is manufactured from 304L stainless steel. These tanks are designed to be used in harsh corrosive environments and receive the ASME "UM" code stamp.



NON-ELECTRIC CONDENSATE PUMPS

PMP Series Pressure Motive Pumps

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PMPLS

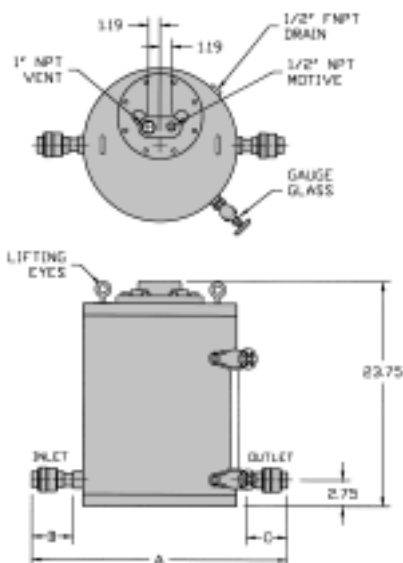


Model	PMPLS
Body	Carbon Steel
Cover	Carbon Steel
Check Valves	Stainless Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 650°F

Note: Optional 200 PSIG PMA/PMO. Consult Factory.

DESCRIPTION

The Model PMPLS pressure motive pumps are low profile. These tanks are often required when draining condensate from process equipment that is positioned close to the ground which limits the filling head of the pump. Pump body & cover are manufactured from carbon steel and are ASME "UM" code stamped.



PMPSP

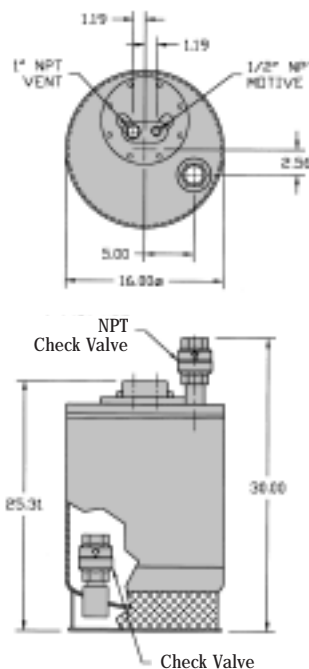
SUMP DRAINER



Model	PMPSP
Body	Carbon Steel
Cover	Carbon Steel
Check Valves	Stainless Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 650°F

DESCRIPTION

The Model PMPSP sump drainer is designed for pumping out & draining pits. Pump body & cover are manufactured from carbon steel and are ASME "UM" code stamped.



DIMENSIONS — inches/pounds

Size Inlet x Outlet	A	B	C	Weight (lbs)
PMPC				
1" x 1"	29 1/2	6	6	360
1 1/2" x 1"	30 3/4	7 1/2	6	365
2" x 1"	31	8	6	370
2" x 1 1/2"	32 1/2	8	7 1/2	380
2" x 2"	32 3/4	8	8	385
3" x 2"	35 1/4	9 1/4	8	390
PMPF				
1" x 1"	30 1/2	6	6	215
1 1/2" x 1"	31 3/4	7 1/2	6	220
2" x 1"	32	8	6	225
2" x 1 1/2"	33 1/2	8	7 1/2	330
2" x 2"	33 3/4	8	8	335
3" x 2"	35 1/4	9 1/4	8	340
PMPS				
1" x 1"	30 1/2	6	6	215
1 1/2" x 1"	31 3/4	7 1/2	6	220
2" x 1"	32	8	6	225
2" x 1 1/2"	33 1/2	8	7 1/2	230
2" x 2"	33 3/4	8	8	235
3" x 2"	35 1/4	9 1/4	8	340
PMPLS				
1" x 1"	29 1/2	5 5/8	5 5/8	200
1 1/2" x 1"	30 3/4	7	5 5/8	205
1 1/2" x 1 1/2"	32 1/8	7	7	210

PUMPS

NON-ELECTRIC CONDENSATE PUMPS

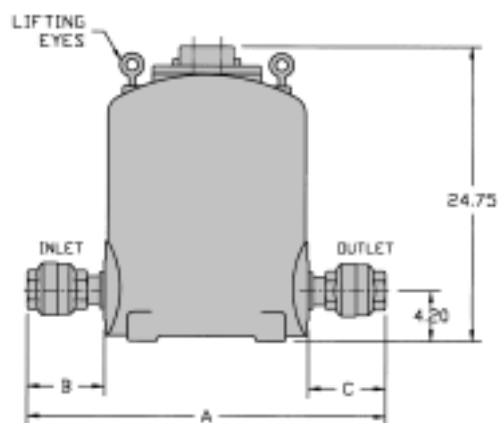
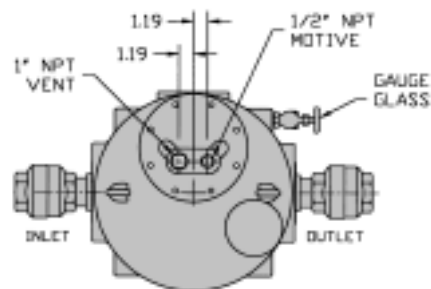
PMPC

Pressure Motive Pump

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PUMPS



Model	PMPC
Body	Ductile Iron
Cover	Ductile Iron
Check Valves	Stainless Steel
PMO Max. Operating Pressure	200 PSIG
TMO Max. Operating Temperature	388°F
PMA Max. Allowable Pressure	200 PSIG @ 650°F
TMA Max. Allowable Temperature	650°F @ 200 PSIG

Note: ASME "UM" code stamp available

TYPICAL APPLICATIONS

The PMPC pressure motive pump body & cover are manufactured from ductile iron. ASME "UM" code stamp available. This pump is typically used when liquids must be moved to higher elevation, higher pressure or extended distances.

FEATURES

- Equipped with our Patented "Snap-Assure" Mechanism which extends the useful life of the pump
- Mechanism incorporates heat-treated stainless steel wear items
- All stainless steel internals for ultimate corrosion resistance
- Dual compression springs made from Inconel-X-750 for high-temperature corrosive service.
- Operates using steam, air, nitrogen or other pressurized gases as the motive force
- Non-Electric – can be used in remote locations or NEMA 4, 7, 9 & hazardous areas

SAMPLE SPECIFICATION

The non-electric pressure powered pump shall be capable of operating with a maximum motive pressure of 200 psig provided by steam, air or other gas supply. The pump body shall be cast ASTM A-395 ductile capable of an ASME "UM" code stamp if requested. The pump mechanism shall be float operated with a patent-pending "Snap-Assure" feature constructed of all stainless steel materials with all load bearing points hardened for extended service life. The mechanism shall feature two Inconel springs used in compression with hardened motive & vent valves to 40c Rockwell.

DIMENSIONS — inches / pounds				
Size (Inlet x Outlet)	A	B	C	Weight (lbs)
1" x 1"	29 1/2	6	6	360
1 1/2" x 1"	30 3/4	7 1/2	6	365
2" x 1"	31	8	6	370
2" x 1 1/2"	32 1/2	8	7 1/2	380
2" x 2"	32 3/4	8	8	385
3" x 2"	35 1/4	9 1/4	8	390

MATERIALS

Body & Cover	Ductile Iron
Cover Gasket	Garlock
Cover Bolts	Steel
Inlet Valve	Hardened Stainless Steel 40 Rc
Vent Valve	Hardened Stainless Steel 40 Rc
Mechanism Yoke	304 Stainless Steel
Ball Float	304 Stainless Steel
Check Valves	Stainless Steel
Springs	Inconel-X-750
Other Internal Comp	Stainless Steel

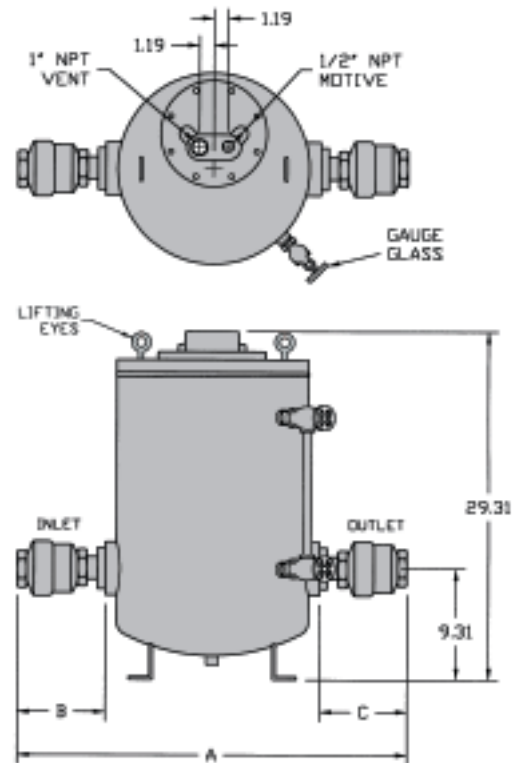
Snap-Assure Patent No. 6572340

NON-ELECTRIC CONDENSATE PUMPS

PMPF

Pressure Motive Pump

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Model	PMPF
Body	Carbon Steel
Cover	Carbon Steel
Check Valves	Stainless Steel
PMO Max. Operating Pressure	200 PSIG
TMO Max. Operating Temperature	388°F
PMA Max. Allowable Pressure	250 PSIG @ 650°F

TYPICAL APPLICATIONS

The PMPF pressure motive pump body & cover are manufactured from carbon steel. These tanks are fabricated with 1/8" corrosion allowance and receive the ASME "UM" code stamp. This pump is typically used when liquids must be moved to higher elevation, higher pressure or extended distances.

FEATURES

- Equipped with our Patented "Snap-Assure" Mechanism which extends the useful life of the pump
- Mechanism incorporates heat-treated stainless steel wear items
- All stainless steel internals for ultimate corrosion resistance
- Dual compression springs made from Inconel-X-750 for high-temperature corrosive service.
- Operates using steam, air, nitrogen or other pressurized gases as the motive force
- Non-Electric – can be used in remote locations or NEMA 4, 7, 9 & hazardous areas

SAMPLE SPECIFICATION

The non-electric pressure powered pump shall be capable of operating with a maximum motive pressure of 200 psig provided by steam, air or other gas supply. The pump body shall be fabricated carbon steel and certified with the ASME "UM" code stamp. The pump mechanism shall be float operated with a patent-pending "snap-assure" feature constructed of all stainless steel materials with all load bearing points hardened for extended service life. The mechanism shall feature two Inconel springs used in compression with hardened motive & vent valves to 40c Rockwell.

DIMENSIONS – inches / pounds				
Size (Inlet x Outlet)	A	B	C	Weight (lbs)
1" x 1"	30 ¹ / ₂	6	6	215
1 ¹ / ₂ " x 1"	31 ³ / ₄	7 ¹ / ₂	6	220
2" x 1"	32	8	6	225
2" x 1 ¹ / ₂ "	33 ¹ / ₂	8	7 ¹ / ₂	230
2" x 2"	33 ³ / ₄	8	8	235
3" x 2"	35 ¹ / ₄	9 ¹ / ₄	8	240

MATERIALS

Body & Cover	Carbon Steel
Cover Gasket	Garlock
Cover Bolts	Steel
Inlet Valve	Hardened Stainless Steel 40 Rc
Vent Valve	Hardened Stainless Steel 40 Rc
Mechanism Yoke	304 Stainless Steel
Ball Float	304 Stainless Steel
Check Valves	Stainless Steel
Springs	Inconel-X-750
Other Internal Comp	Stainless Steel

Snap-Assure Patent No. 6572340

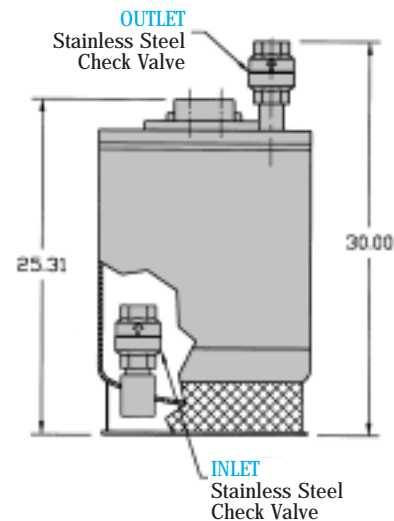
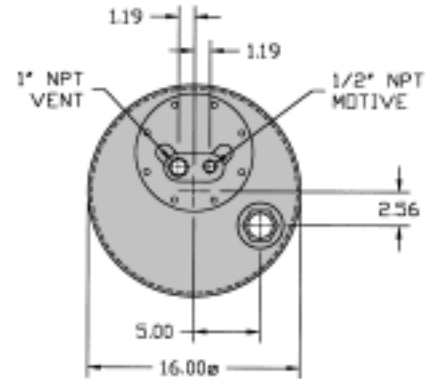
NON-ELECTRIC CONDENSATE PUMPS

PMPSP

Sump Drainer

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Model	PMPSP
Body	Carbon Steel
Cover	Ductile Iron
Check Valves	Stainless Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 650°F

Connection Sizes	
NPT	
Inlet	Outlet
1 1/2" x	1 1/2"
2" x	2"
3" x	2"

TYPICAL APPLICATIONS

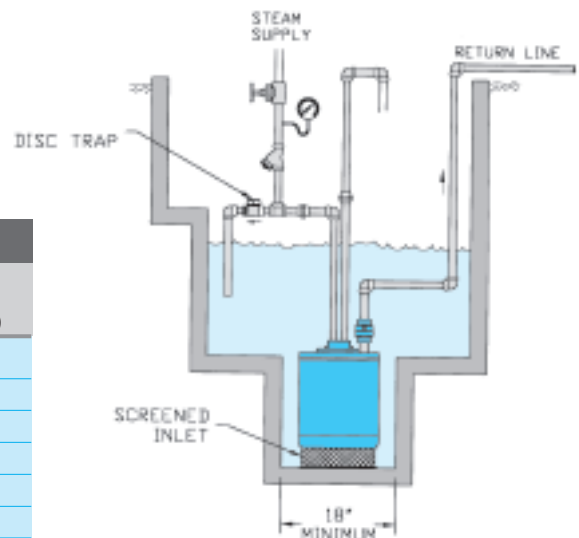
The PMPSP Sump Drainer uses the identical internal mechanism as the standard PMP models. The piping configuration is such that the liquid is discharged vertical upwards as opposed to horizontally out the side. This allows the unit to be easily positioned inside of a sump area. Condensate or water from the sump enters the tank through a stainless steel low resistance check valve.

FEATURES

- Equipped with our Patented "Snap-Assure" Mechanism which extends the useful life of the pump
- Mechanism incorporates heat-treated stainless steel wear items
- All stainless steel internals for ultimate corrosion resistance
- Dual compression springs made from Inconel-X-750 for high-temperature corrosive service.
- Operates using steam, air, nitrogen or other pressurized gases as the motive force
- Non-Electric – can be used in remote locations or NEMA 4, 7, 9 & hazardous areas

CAPACITIES – Water (gpm) for 1 1/2" x 1 1/2" Size								
Motive Pressure (PSIG)	Capacity Correction Factors		Back Pressure (PSIG)					
	2" x 2"	3" x 2"	0	10	20	40	70	100
10	2.5	3	11.7					
20	1.8	2.4	12.5	9.2				
40	1.9	2.4	13.1	10.4	8.7	6.8		
70	1.7	2.4	12.9	11.0	9.4	7.1		
100	1.6	2	12.3	10.6	9.4	7.5	5.4	
125	1.6	2	11.6	10.1	9.0	7.5	5.6	4.3
150	1.6	2	10.7	9.5	8.8	7.2	5.7	4.5

Note: Capacities in above chart are for the 1-1/2" x 1-1/2" model. To determine capacities for the 2" x 2" & 3" x 2" models, multiply capacity in chart by appropriate correction factor.



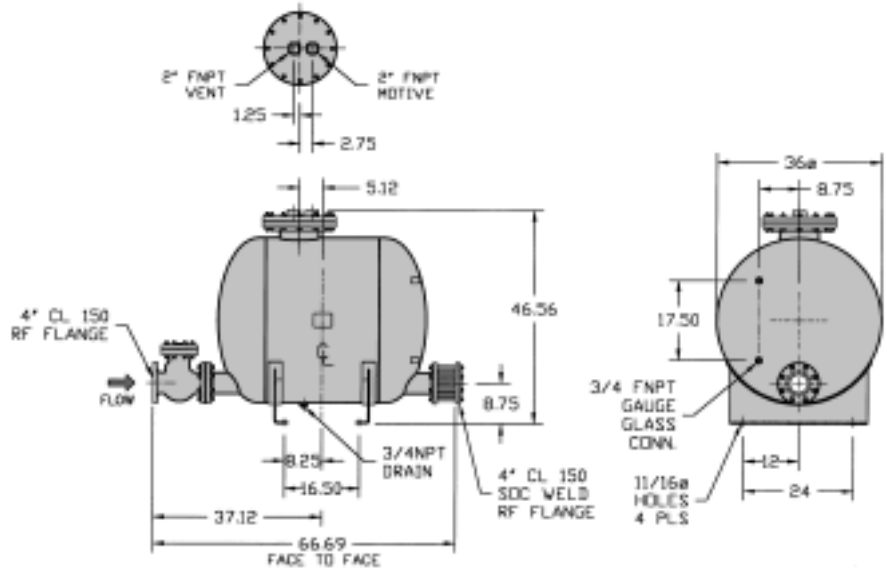
Snap-Assure Patent No. 6572340

NON-ELECTRIC CONDENSATE PUMPS

PMPBP

Pressure Motive Pump

Revised 9/2004



Model	PMPBP
Body	Carbon Steel
Cover	Carbon Steel
Check Valves	Stainless Steel & Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 470°F

MATERIALS	
Body & Cover	Carbon Steel
Cover Gasket	Non-Asbestos
Cover Bolts	Steel
Inlet Valve	Stainless Steel
Vent Valve	Stainless Steel
Mechanism Yoke	304 Stainless Steel
Ball Float	304 Stainless Steel
Check Valves	Stainless Steel & Steel
Springs	Stainless Steel
Other Internal Comp	Stainless Steel

TYPICAL APPLICATIONS

The PMPBP is an *extremely high-capacity* pressure motive pump for applications requiring large transfer of condensate or other liquids. The internal operating mechanism function identically to other pumps in the PMP series.

FEATURES

- All stainless steel internals for ultimate corrosion resistance
- Operates using steam, air, nitrogen or other pressurized gases as the motive force
- Non-Electric – can be used in remote locations or NEMA 4, 7, 9 & hazardous areas

OPTIONS

- Cycle counter for measuring the amount of condensate flow through the pump.
- Insulation jackets are available to stop radiation losses through the pump body.
- Sight glass for monitoring liquid level inside pump body.

PUMPS

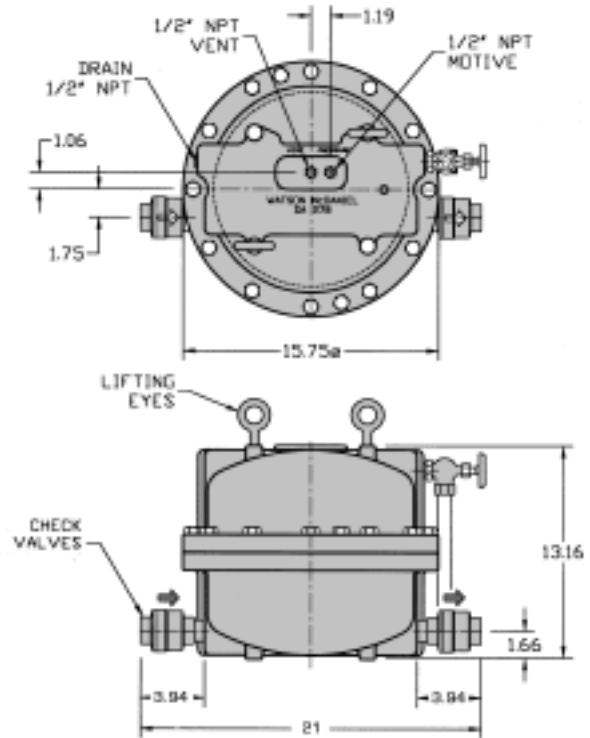
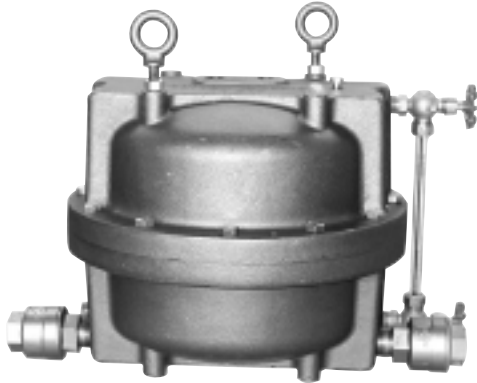
NON-ELECTRIC CONDENSATE PUMPS

PMPM

Pressure Motive Pump

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Revised 9/2004



Model	PMPM
Body	Cast Iron
Cover	Cast Iron
Sizes	1", 1-1/4"
Check Valves	Stainless Steel
PMO Max. Operating Pressure	150 PSIG
TMO Max. Operating Temperature	366°F
PMA Max. Allowable Pressure	150 PSIG @ 450°F

TYPICAL APPLICATIONS

The Model PMPM pressure motive pump has an *extremely low-profile*. These low-profile tanks are required when draining condensate from process equipment positioned close to the ground which limits the filling head of the pump.

FEATURES

- Mechanism incorporates heat-treated stainless steel wear items for extended service life
- All stainless steel internals for ultimate corrosion resistance
- Dual springs made from Inconel-X-750 for high-temperature corrosive service
- Operates using steam, air, nitrogen or other pressurized gases as the motive force
- Low-profile design
- Non-Electric – can be used in remote locations or NEMA 4, 7, 9 & hazardous areas

MATERIALS

Body & Cover	Cast Iron
Cover Gasket	Garlock
Cover Bolts	Steel
Inlet Valve	Hardened Stainless Steel 40 Rc
Vent Valve	Hardened Stainless Steel 40 Rc
Mechanism Yoke	304 Stainless Steel
Ball Float	304 Stainless Steel
Check Valves	Stainless Steel
Springs	Inconel-X-750
Other Internal Comp	Stainless Steel

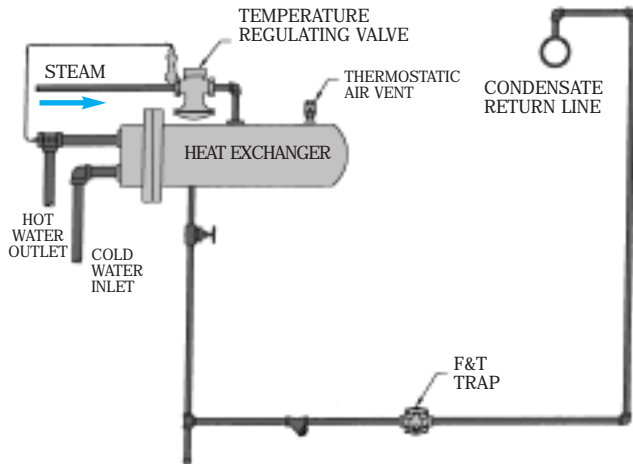
NON-ELECTRIC CONDENSATE PUMPS

PMPM

Pressure Motive Pump

Revised 9/2004

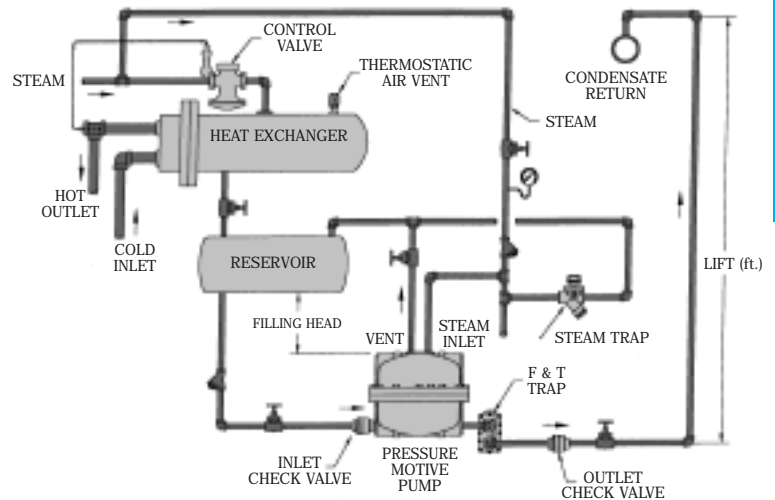
Problem



PROBLEM

STALL CONDITION WITH MODULATED STEAM FLOW.
 Steam flowing into the heat exchanger is controlled by the temperature regulating valve. When the temperature regulating valve is fully open, any condensate forming inside the heat exchangers will be pushed through the steam trap into the condensate return line. When the temperature regulating valve partially or fully closes the steam pressure inside the heat exchanger can no longer overcome the back pressure against the outlet of the trap and the condensate will build up in the heat exchanger. This condition is called system stall and results in water hammer and poor heat transfer due to the condensate build-up in the heat exchanger.

Solution



SOLUTION

USE A PRESSURE MOTIVE PUMP AS SHOWN. When the temperature regulating valve is fully open, any condensate forming inside the heat exchangers will be pushed through the pump and steam trap into condensate return line. When the temperature regulating valve closes, any condensate forming inside the heat exchanger will drain by gravity into the pump tank. When the level inside the pump tank reaches the trip point, high pressure steam will drive the condensate from the tank into the condensate return line. Note: A larger steam trap than normally required to drain the heat exchanger must be used to handle the high instantaneous discharge rate of the pump.

CAPACITIES – Condensate (lbs/hr)

Motive Pressure (PSIG)	Back Pressure (PSIG)	6" Filling Head			
		Steam Motive		Air Motive	
		1"	1 1/4"	1"	1 1/4"
25	15	1200	1800	1720	2580
25	5	1970	2955	2265	3398
50	40	1200	1800	1640	2460
50	25	1480	2220	1980	2970
50	15	1860	2790	2220	3330
50	5	2240	3360	2485	3728
75	60	1160	1740	1935	2903
75	40	1640	2460	2185	3278
75	25	1960	2960	2340	3510
100	60	1415	2122	2020	3030
100	40	1825	2732	2280	3420
100	25	1985	2977	2420	3630
100	15	2175	3262	2455	3683
150	100	1120	1680	1456	2184
150	80	1220	1830	1525	2288
150	60	1570	2355	1885	2828

SIZING

The capacity of the PMPM is based on the inlet steam pressure, the system back pressure, and the amount of filling head available. The trap used in a pump trap combination must be sized to handle the instantaneous discharge of the pump.

Choose a F&T trap that will pass the condensate load at a 1/4 PSI differential pressure. The PMO of the steam trap must be higher than the motive inlet steam pressure. Consult factory for proper choice of steam trap.

HOW TO ORDER

- Specify:
- Model – PMPM
 - For pump/trap combination – to properly size the steam trap, specify condensate load (lbs/hr) and inlet motive pressure for the pump

NON-ELECTRIC CONDENSATE PUMPS

Skid Mounted Systems PMPC & PMPF Skid Mounted Systems

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Standard Skid Mounted Systems

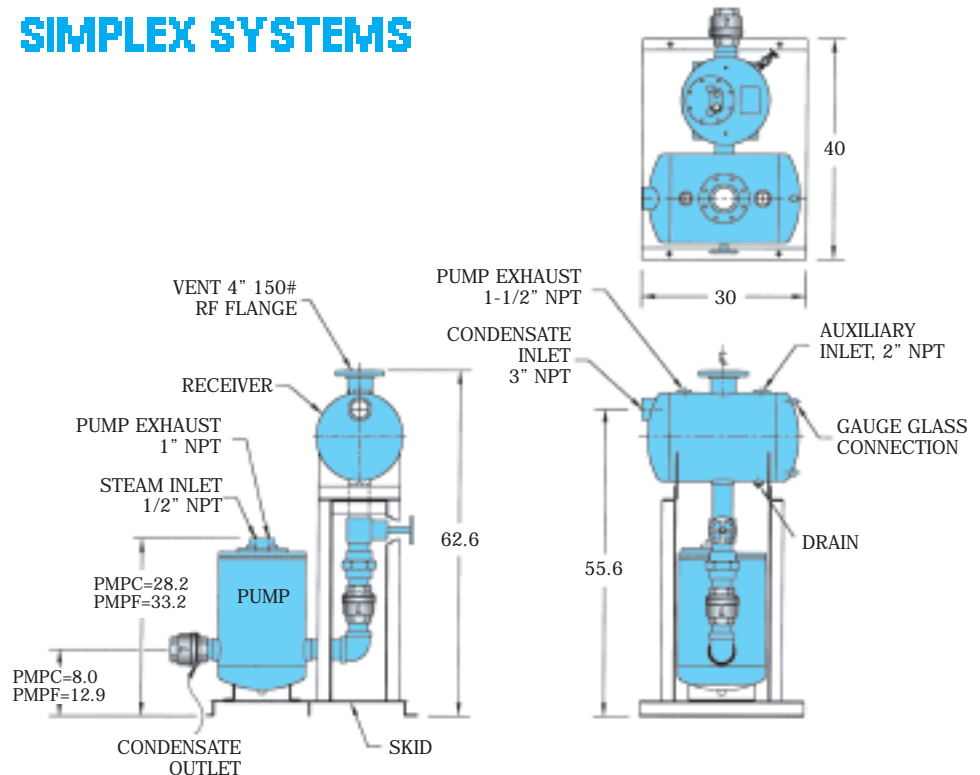
FEATURES

- Easy to install with only four connections to be made in the field
- Dramatically reduces installations costs with all system elements pre-piped
- Utilizing Watson McDaniel's years of experience will ensure that vented receivers or pressurized reservoirs are properly sized for optimum system performance
- Watson McDaniel's fully-qualified fabrication facility is ASME code certified. Our engineers can design and build complete custom systems to meet all your requirements

TYPICAL OPTIONS

- Gauge glass assembly
- Cycle counter
- Insulation covers
- Motive steam drip trap
- Overflow pipe connection
- Pressure regulator for motive supply line

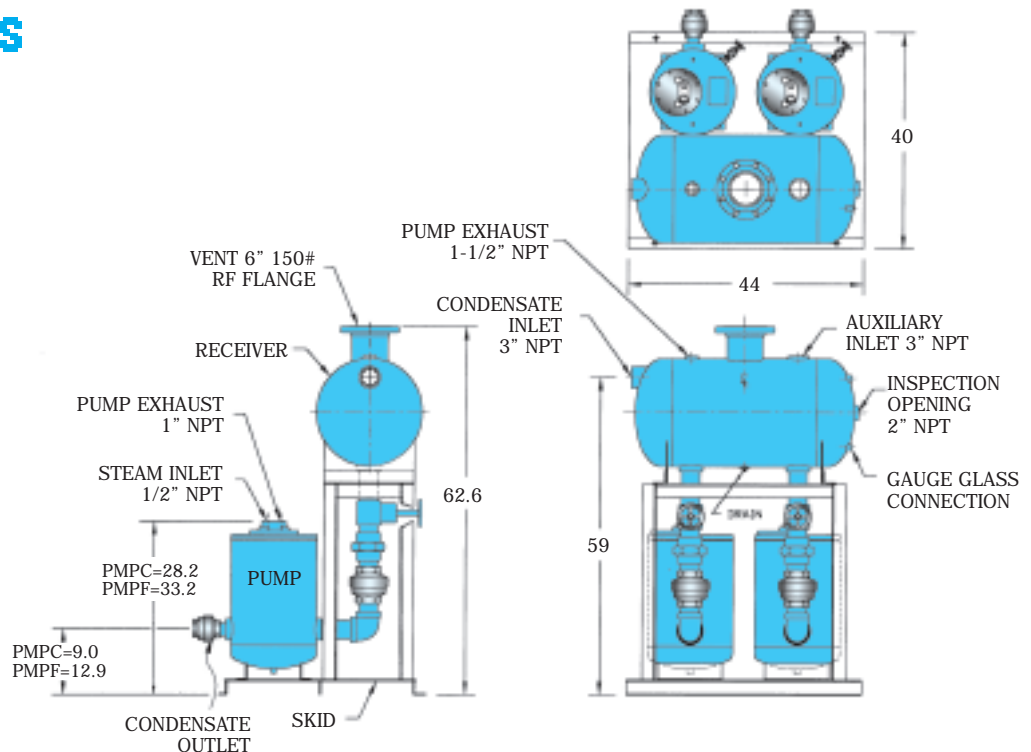
SIMPLEX SYSTEMS



DUPLEX SYSTEMS



Note: Triplex and Quadraplex Systems also available.



NON-ELECTRIC CONDENSATE PUMPS

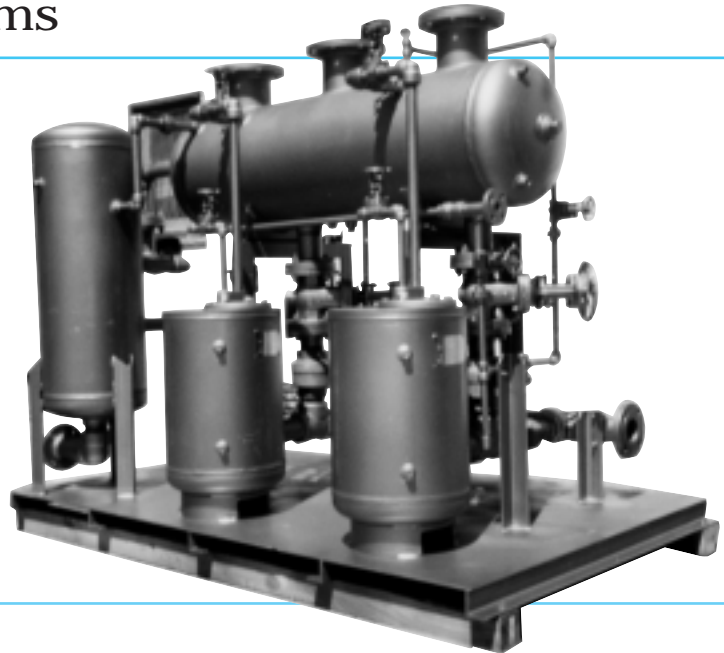
Skid Mounted Systems

Pressure Motive Pumps

Revised 9/2004

Custom Fabricated Systems

Watson McDaniel's fully equipped ASME qualified fabrication facility stands ready to assist you with all of your fabrication needs. Our engineering staff specializes in the design of Pressure Motive Condensate Pumping Systems for both industrial and institutional applications. You can order either standard packages, available from stock, or specialized systems to meet your specific needs.

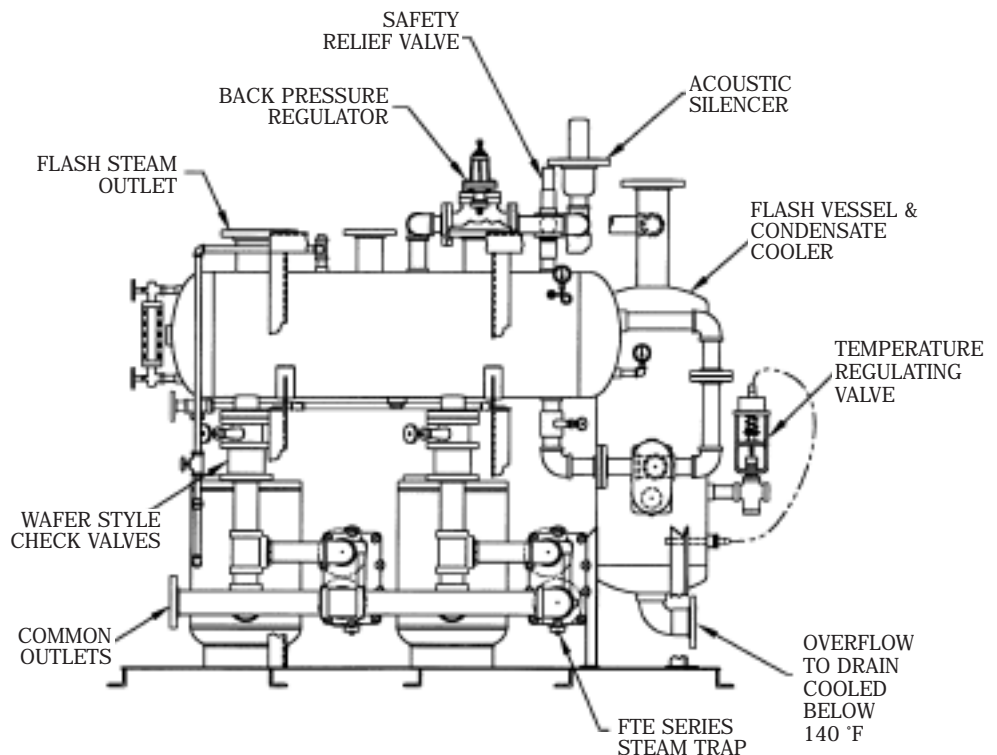


PUMPS

DESCRIPTION OF CUSTOM SYSTEM

This "Closed Loop" Duplex Pump package utilizes two PMPF Pumps, two FTE Steam Traps, and one 65 gallon receiver tank equipped with a safety relief valve. The Receiver is vented to take the flash steam away at 29 PSIG for usage elsewhere in the plant. To accomplish this, our pilot-operated relief valve is mounted just off the vent line and set to maintain the 29 PSIG pressure. If pressure exceeds the set, the BPR unit will dump to atmosphere to the supply acoustic silencer.

Another custom feature is an overflow circuit utilizing a custom flash tank equipped with our Series 153 Temperature Regulator for cooling applications. In the event of a pump failure, the flooded receiver will overflow the hot condensate into the flash vessel where steam will vent to atmosphere while the condensate gets injected with cold water to safely dump to drain.



NON-ELECTRIC CONDENSATE PUMPS

WPT Series

Pump Trap Combinations

WPT Series Pump/Trap combinations simplify Selection & Installation of Pressure Motive Pumps

- 5 size ranges available
- Up to 13,000 lbs/hr of condensate load

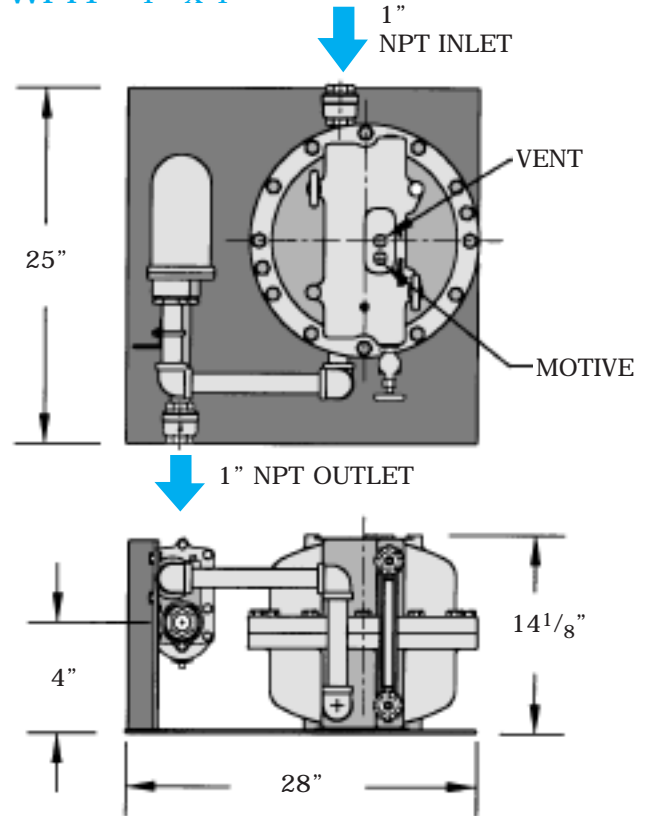
TYPICAL APPLICATIONS

The Watson McDaniel WPT Pump-Trap Combinations are excellent for draining heat exchangers or other equipment that is being fed by a temperature regulator or a temperature control valve. In these applications, the steam pressure in the heat exchanger may not be sufficient to overcome the back pressure in the condensate return line. When this condition occurs, the pressure powered pump takes over and uses high pressure steam supplied to the pump to discharge the condensate through the trap. When sufficient pressure does exist, the system functions like a standard steam trap.

PUMP-TRAP FEATURES

- Steam trap and pump are pre-mounted together on a single base for easy installation
- Engineering and selection is simplified.

WPT1 - 1" x 1"

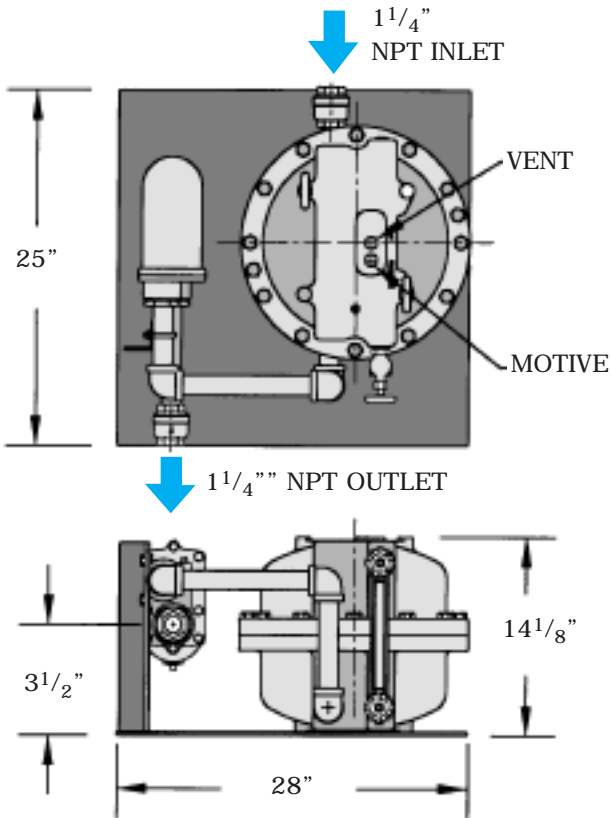


CAPACITIES – Condensate (lbs/hr) Using steam as a motive pressure

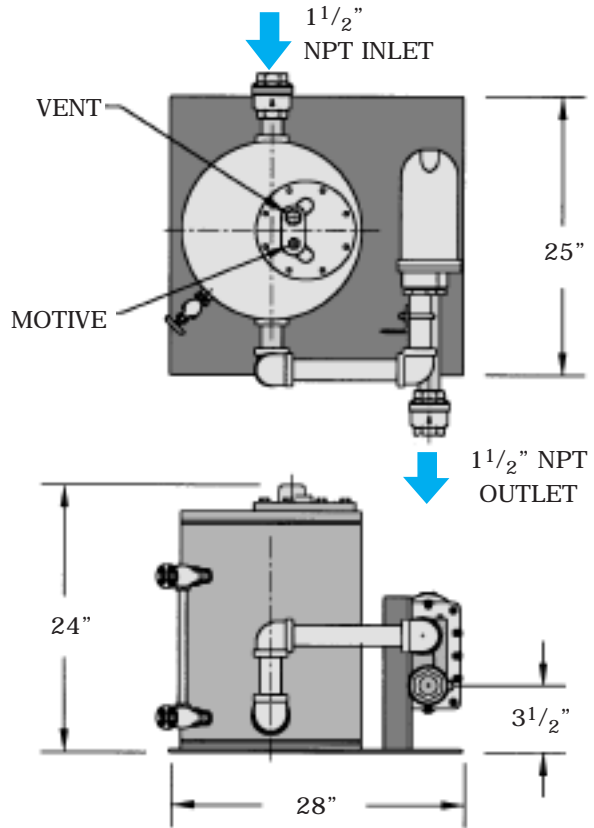
Motive Pressure (PSIG)	Total Back Pressure (PSIG)	WPT 1	WPT 2	WPT 3	WPT 4	WPT 5
		1" x 1" 6" Head	1 1/4" x 1 1/4" 6" Head	1 1/2" x 1 1/2" 12" Head	2" x 2" 12" Head	3" x 2" 12" Head
5	2	185	335	1310	2320	4270
10	5	370	648	1760	3740	6230
10	2	502	898	2350	5640	9450
25	15	958	1590	2700	4690	7230
25	10	1240	2090	3020	5970	9370
25	5	1490	2570	3780	6850	11400
50	40	1010	1610	2090	3410	5040
50	25	1220	1970	3620	6650	10200
50	10	1600	2680	4080	7140	11500
75	60	993	1560	2250	3730	5660
75	40	1380	2190	3470	6010	8770
75	15	1550	2580	4390	7920	12400
100	80	612	951	2620	4390	6140
100	60	1210	1900	3390	5780	8120
100	40	1540	2440	4310	6940	10000
100	15	1720	2840	4620	8000	12300
125	115	195	301	2280	3490	4440
125	100	488	753	2880	4420	5720
125	80	836	1300	3520	5700	7630
125	60	1280	2000	4110	6880	9390
125	40	1420	2270	4910	7800	11100
125	15	1470	2440	5120	8420	12900
150	120	588	904	2560	3640	5100
150	100	977	1510	3020	4610	6270
150	80	1060	1640	3630	5780	8140
150	60	1340	2100	4230	6910	9920
150	40	1420	2260	4830	7930	11700
150	15	1450	2390	5230	8590	13300

NON-ELECTRIC CONDENSATE PUMPS

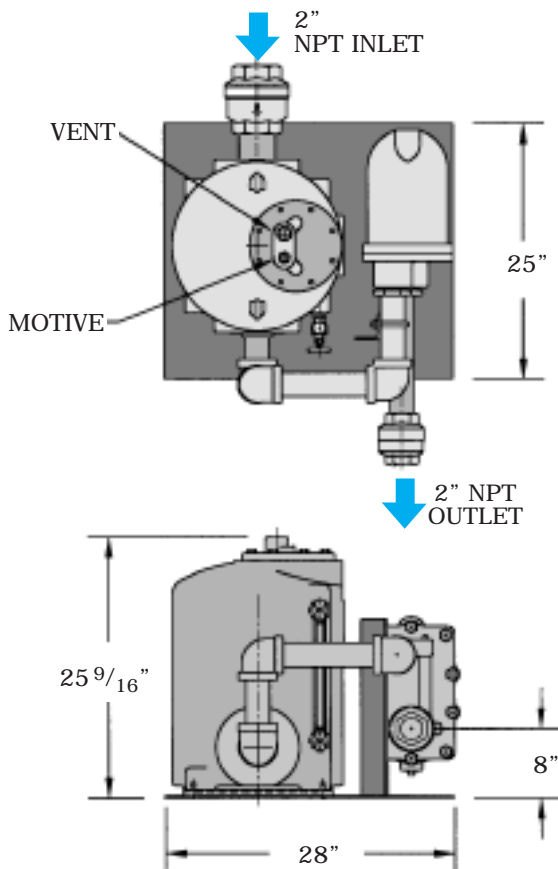
WPT2 - 1 1/4" x 1 1/4"



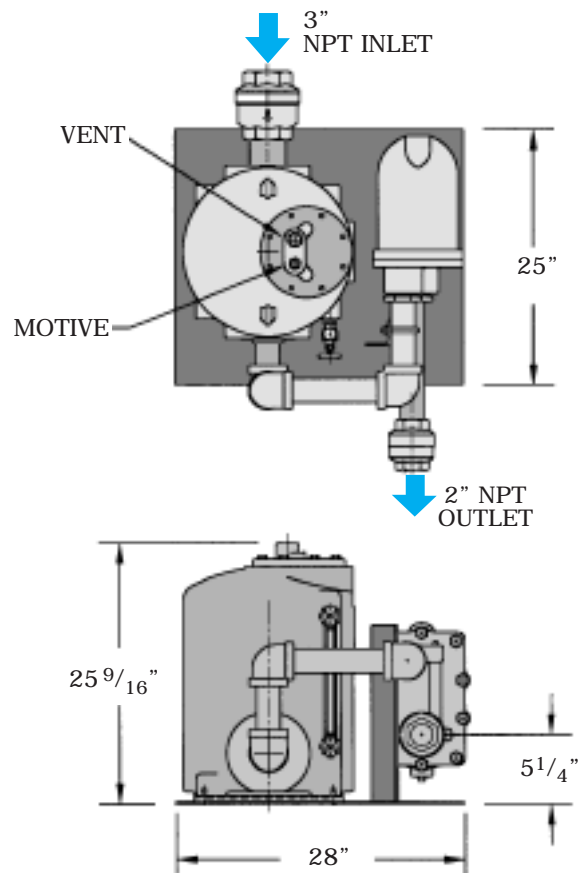
WPT3 - 1 1/2" x 1 1/2"



WPT4 - 2" x 2"



WPT5 - 3" x 2"



NON-ELECTRIC CONDENSATE PUMPS

Accessories & Options

Pressure Motive Pumps

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Receiver Tanks

Four standard condensate receiver sizes are available for our Pressure Motive Pump Systems. 21, 48, 75 and 116 gallons. Custom Receiver fabrication is available with our ASME certified fabrication facility.

Pre-Piped PRV & Drip leg

A fully-assembled Pre-piped PRV, Drip Leg, or PRV and Drip Leg Assembly guarantees proper installation of your PMP System. It assures that your skid package performs to optimum levels.

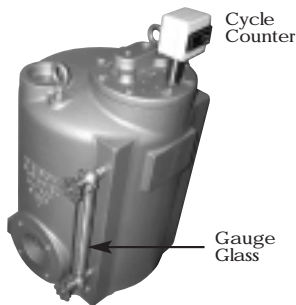
PUMPS

Gauge Glass

Watson McDaniel's Pump Tanks are available with either bronze or stainless steel gauge glass to determine condensate level inside the tank.

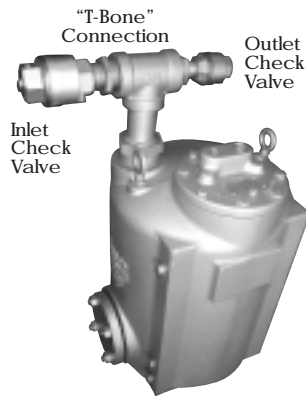
Cycle Counter

The cycle counter option allows you to calculate and measure condensate flow through the pump. This also gives you an indication when maintenance and repairs to your mechanism may be required.



Cycle Counter

Gauge Glass



"T-Bone" Connection

Inlet Check Valve

Outlet Check Valve

Vertical Discharge

Vertical Discharge Pump with "T-Bone" connection allows inlet and outlet condensate hook-ups to be made above the pump. This is an advantage when space is limited around the base of the pump due to equipment or piping obstructions.

Product Description

Model Code

Product Description	Model Code
GAUGE GLASS Standard Bronze for PMPC, PMPF, PMPLS, 21Gallon Receiver	Gauge Glass 1
for PMPM Mini Pump	Gauge Glass PMPM
for 48 Gallon Receiver	Gauge Glass 1
for 75 Gallon Receiver	Gauge Glass 1
for 116 Gallon Receiver	Gauge Glass 1

Following Options are available for gauge glasses. Contact factory.

Auto Drain (self-drain) Stainless Steel Armored	Gauge Glass 1A
Reflex Gauge for PMPC, PMPF, PMPLS, 21 Gallon Receiver	Gauge Glass - 1HP

GAUGE GLASS Stainless Steel (for PMPSS)	Gauge Glass SS
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Cycle Counter: Digital Cycle Counter fits all Pressure Motive Pumps	1529100
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ASME Code Stamp for PMPC Pump Tank (Standard on 21, 48, 75, 116 Gallon Receivers and PMPF, PMPLS, PMPSS pump tanks)	
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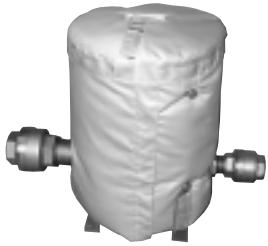
Insulation Cover	PMPC-Ductile Iron Pump	INSUL-CRV-PMPC
	PMPF-Fabricated Steel Pump	INSUL-CRV-PMPF
	PMPLS-Low Profile Pump	INSUL-CRV-PMPLS
	PMPBP-High Capacity Pump	INSUL-CRV-PMPBP
	PMPM-Mini Pump	INSUL-CRV-PMPM
	21 Gallon Receiver	INSUL-CRV-21
	48 Gallon Receiver	INSUL-CRV-48
	75 Gallon Receiver	INSUL-CRV-75
	116 Gallon Receiver	INSUL-CRV-116

NON-ELECTRIC CONDENSATE PUMPS

Accessories & Options

Pressure Motive Pumps

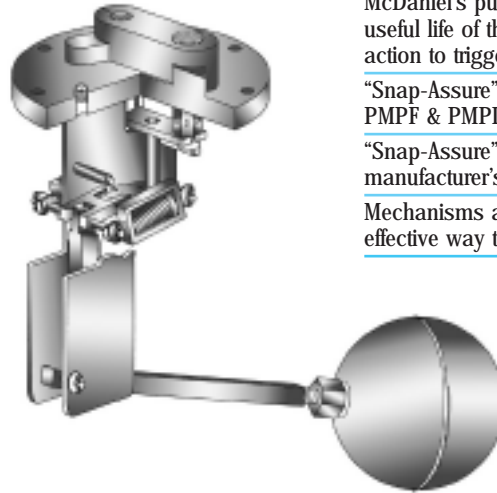
Revised 9/2004



Insulation Jacket

Insulation Jackets conserve energy by reducing heat loss. They also improve safety by protecting personnel from hot surfaces. Jackets have velcro closures for easy on-off removal. Fits tightly around pump tanks and receivers.

Patented “Snap-Assure” Feature



Patented “Snap-Assure” feature is found only on Watson McDaniel’s pump mechanisms. “Snap-Assure” extends the useful life of the pump by assuring the internal toggle action to trigger (snap) at every cycle.

“Snap-Assure” is supplied standard in Models PMPC, PMPF & PMPLS.

“Snap-Assure” mechanisms will also fit other manufacturer’s pump tanks.

Mechanisms are simple and easy to replace and cost-effective way to make your pump as good as new.

PUMPS

Product Description		Model Code
Pre-piped Accessories		
	Pre-piped Pressure regulating valve for motive steam or air	PRV1
	Pre-piped drip leg station with steam trap	PRV2
	Pre-piped drip leg with steam trap and PRV	PRV3
	Pre-piped exhaust line	PRV4
Mechanisms		
	New Mechanism Assembly with Cover	
	PMPF	900-03
	PMPC, PMPLS	910-03
	PMPBP	900-01
	PMPHP	920-03
	New Mechanism Assembly - PMPM	911-03
Mechanisms Rebuilt*		
	PMPF	900-03R
	PMPC, PMPLS	910-03R
Check Valves	Stainless Steel: 1/2” - 3” NPT	SEE WSSCV Page

* Note for Rebuilt Mechanisms:

The exchange program is for mechanisms with two years of service or less. The old mechanism must be returned along with the order for the rebuilt mechanism. Orders without old mechanisms will be invoiced at the new mechanism price.

NON-ELECTRIC CONDENSATE PUMPS

Sizing & Selection

Pressure Motive Pumps - Capacities

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PUMPS

CAPACITIES – Condensate (lbs/hr) Using steam as a motive pressure												
Motive Pressure (PSIG)	Total Back Pressure (PSIG)	PMPLS 1" X 1" 6" Head	PMPC, PMPF, PMPSS*,									PMPBP 4" x 4" 24" Head
			1 1/2" X 1" 12" Head	1 1/2" X 1 1/2" 12" Head	2 X 1" 12" Head	2" X 1 1/2" 12" Head	2" X 2" 12" Head	3" x 2" 12" Head	3" x 2" Duplex	3" x 2" Triplex	3" x 2" Quadruplex	
5	2	1,760	1,860	1,920	2,860	3,180	3,540	5,000	10,000	15,000	20,000	16,600
10	5	1,870	2,200	2,450	4,350	4,840	5,380	7,210	14,420	21,630	28,840	19,000
10	2	2,200	3,030	3,370	6,880	7,650	8,500	11,110	22,220	33,330	44,440	22,600
25	15	1,650	3,130	3,480	4,990	5,550	6,170	8,230	16,460	24,690	32,920	33,200
25	10	1,980	3,600	3,990	6,560	7,290	8,100	10,780	21,560	32,340	43,120	40,300
25	5	2,300	4,700	5,200	7,970	8,860	9,850	13,350	26,700	40,050	53,400	46,200
50	40	1,650	2,280	2,530	3,370	3,750	4,170	5,670	11,340	17,010	22,680	33,300
50	25	1,980	4,050	4,500	6,800	7,560	8,440	11,550	23,100	34,650	46,200	40,100
50	10	2,300	4,700	5,240	7,970	8,860	9,850	13,440	26,880	40,320	53,760	47,000
75	60	1,540	2,400	2,660	3,600	4,000	4,440	6,340	12,680	19,020	25,360	32,900
75	40	1,980	3,780	4,190	5,920	6,580	7,320	9,870	19,740	29,610	39,480	39,400
75	15	2,420	5,130	5,700	8,580	9,540	10,600	14,330	28,660	42,990	57,320	47,200
100	80	1,650	2,750	3,060	4,160	4,630	5,150	6,860	13,720	20,580	27,440	27,200
100	60	1,870	3,600	4,000	5,560	6,180	6,870	9,100	18,200	27,300	36,400	35,100
100	40	2,090	4,700	5,210	6,880	7,650	8,500	11,270	22,540	33,810	45,080	42,100
100	15	2,420	5,400	6,010	8,740	9,720	10,800	14,330	28,660	42,990	57,320	48,000
125	115	1,430	2,380	2,640	3,270	3,640	4,050	4,960	9,920	14,880	19,840	19,500
125	100	1,540	2,980	3,330	4,140	4,600	5,130	6,390	12,780	19,170	25,560	25,300
125	80	1,760	3,430	4,100	5,400	6,000	6,670	8,540	17,080	25,620	34,160	32,200
125	60	1,980	4,170	4,850	6,600	7,340	8,160	10,530	21,060	31,590	42,120	38,500
125	40	2,200	5,100	5,950	7,760	8,630	9,590	12,500	25,000	37,500	50,000	44,000
125	15	2,420	5,850	6,660	9,240	10,270	11,420	15,100	30,200	45,300	60,400	49,200
150	120	1,590	2,650	2,940	3,400	3,780	4,200	5,690	11,380	17,070	22,760	21,600
150	100	1,640	3,150	3,490	4,320	4,800	5,350	7,000	14,000	21,000	28,000	29,000
150	80	1,860	3,800	4,230	5,490	6,100	6,770	9,100	18,200	27,300	36,400	34,500
150	60	2,080	4,500	5,000	6,660	7,400	8,240	11,120	22,240	33,360	44,480	40,300
150	40	2,300	5,290	5,870	7,920	8,800	9,780	13,220	26,440	39,660	52,880	44,700
150	15	2,520	6,100	6,820	9,450	10,500	11,680	15,500	31,000	46,500	62,000	49,500
175	140	-	2,600	2,900	3,800	4,200	4,650	6,200	12,400	18,600	24,800	-
175	120	-	3,100	3,400	4,400	4,850	5,400	7,200	14,400	21,600	28,800	-
175	100	-	3,600	4,000	5,100	5,700	6,300	8,400	16,800	25,200	33,600	-
175	60	-	4,850	5,400	6,900	7,700	8,550	11,400	22,800	34,200	45,600	-
175	40	-	6,200	6,900	8,900	9,850	10,950	14,600	29,200	43,800	58,400	-
175	15	-	7,500	8,350	10,600	11,900	13,200	17,600	35,200	52,800	70,400	-
200	160	-	2,400	2,700	3,500	3,800	4,300	5,700	11,400	17,100	22,800	-
200	140	-	3,100	3,400	4,400	4,900	5,400	7,200	14,400	21,600	28,800	-
200	100	-	4,200	4,650	5,950	6,600	7,350	9,800	19,600	29,400	39,200	-
200	80	-	4,700	5,250	6,750	7,500	8,300	11,100	22,200	33,300	44,400	-
200	40	-	6,800	7,550	9,700	10,800	11,950	15,950	31,900	47,850	63,800	-
200	15	-	8,400	9,350	12,000	13,300	14,800	19,700	39,400	59,100	78,800	-

* PMPSS is only rated to 150 PSIG.

Capacity Correction Factors for Alternate Filling Heads							
Pump Inlet Size	Filling Head						
	6"	12"	18"	24"	36"	48"	60"
1"	1.00	1.10	1.20	1.30	1.50		
1 1/2"	0.70	1.00	1.10	1.20	1.35		
2"	0.70	1.00	1.10	1.20	1.35		
3"	0.84	1.00	1.04	1.08	1.20		
4"			0.80	1.00	1.10	1.15	1.20

Capacity Correction Factors for Gas as Motive Pressure									
Pump Inlet Size	% of Back Pressure vs Motive Pressure								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
1"	1.00	1.13	1.16	1.20	1.25	1.30	1.35	1.40	1.45
1 1/2"	1.04	1.06	1.08	1.10	1.12	1.15	1.18	1.23	1.28
2"	1.04	1.06	1.08	1.10	1.12	1.15	1.18	1.23	1.28
3"	1.04	1.06	1.08	1.10	1.12	1.15	1.18	1.23	1.28
4"	No Capacity Change								

NOTE: When the filling head differs from the standard filling height, the capacity of the pressure power pumps are either increased or decreased. For example, a pump with a 3" inlet that has a filling head of 36" as opposed to a standard filling head of 12", will have an increase capacity of 20%. Multiply the value found in the Capacity Table above by 1.2.

NON-ELECTRIC CONDENSATE PUMPS

Sizing & Selection Pressure Motive Pumps

Revised 9/2004

SIZING & SELECTION

The size of a Pressure Motive Pump is designated by the size of the inlet and outlet check valve. The larger the check valves used, the more capacity the pump can handle. For example: a 3" x 2" pump has a 3" inlet check valve and a 2" outlet check valve.

Stand alone pump units include a pump and check valves only.

Skid systems include pump, check valves and receiver tank mounted together on a frame. Skid systems are available in Simplex, Duplex, Triplex and Quadraplex models.

When sizing and selecting a Pressure Motive Pump there are five system conditions that are required:

- 1 Condensate load
- 2 Inlet motive pressure for operating the pump
- 3 Vertical height condensate must be raised
- 4 Pressure in the condensate return pipe
- 5 Filling head into the pump

SAMPLE SYSTEM CONDITIONS

1	Condensate Load	8,000 lbs/hr
2	Inlet Steam Pressure	100 PSIG
3	Vertical Lift	23 ft.
4	Pressure in Return Pipe	30 PSIG
5	Filling Head	12 inches

SOLUTION

$$\begin{array}{r}
 * \text{ Pressure required to Lift Condensate } 0.433 \times 23 \text{ ft.} = 10 \text{ PSIG} \\
 \text{Pressure in Return Pipe} \quad \quad \quad + 30 \text{ PSIG} \\
 \hline
 \text{Total Back Pressure} \quad \quad \quad = 40 \text{ PSIG}
 \end{array}$$

From the capacity chart using 100 PSIG inlet pressure and 40 psig back pressure a 2" x 2" pump has a capacity of 8,500 lbs/hr.

**Note: To find the pressure required to lift condensate in PSIG, multiply the lift in feet by 0.433.*

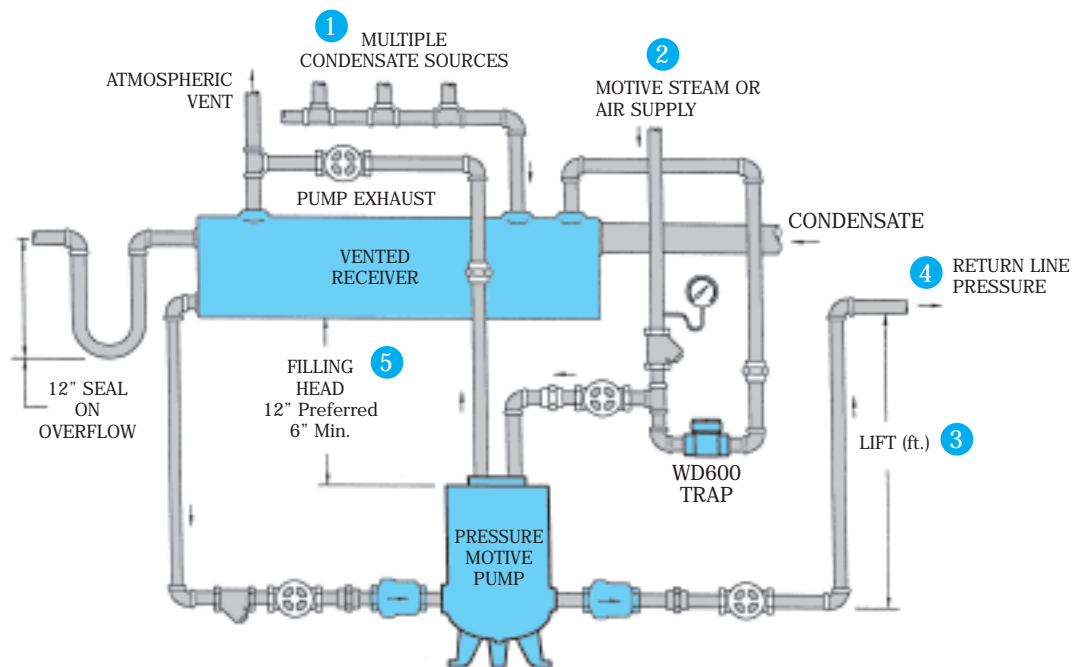
HOW TO ORDER

Specify:

- 1) Model of pump
- 2) Size of pump
- 3) Single pump or skid system
- 4) Options:
- 5) If ordering a customized skid system specify receiver size

Example:

PMPC
2" x 2"
Duplex
Gauge Glass
Cycle Counter



NON-ELECTRIC CONDENSATE PUMPS

Sizing & Selection Pressure Motive Pumps

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Closed Loop System (Pressurized Reservoir)

RESERVOIR SIZING

When sizing Pressure Motive Pumps for closed loop return systems a condensate reservoir should be installed on the inlet side of the pump and below the equipment to be drained. This will enable the condensate to collect while the pump is in the discharge cycle, thus preventing liquid backup into the equipment. The Reservoir Sizing Table gives the minimum pipe size & length to produce the required reservoir volume to accommodate the condensate load.

How to select: Determine the total condensate load to be pumped. Find that load value or greater in the table and move right to read the pipe lengths in feet with the diameters indicated above.

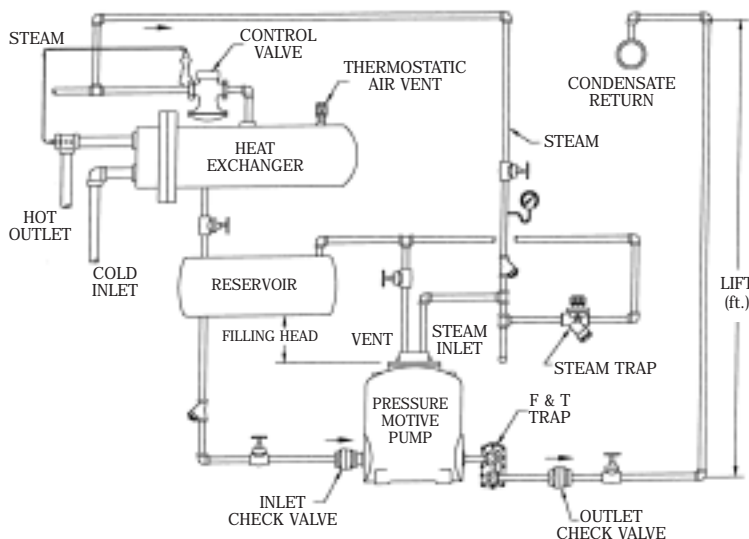
Customized reservoirs can be designed to accommodate specific space and dimensional requirements. It is critical for these designs to have adequate vapor space for condensate to collect. When the volume required is known, from the previous selection table, optional pipe diameters and lengths can be selected to provide the same or greater volume. This table will allow you to convert required volumes to customized sizes needed. Watson McDaniel can furnish customized Pressure Motive Pump Packages to fit your needs.

RESERVOIR PIPE LENGTH in feet (ft)

Condensate Load (lbs/hr)	Reservoir Pipe Size (NPS)				
	3"	4"	6"	8"	10"
0-500	2'				
1,000	2'				
1,500	3'	2'			
2,000	3.5'	2'	1'		
3,000		3'	2'		
4,000		4'	2'	1'	
5,000		6'	3'	2'	
6,000			3'	2'	
7,000			3'	2'	
8,000			4'	2'	
9,000			4.5'	3'	2'
10,000			5'	3'	2'
20,000				5.5'	4'

Note: When back pressure against the pump outlet is less than 50% of the motive pressure, the above pipe lengths can be reduced by half.

DATA REQUIRED FOR SIZING PMP IN A CLOSED LOOP SYSTEM (pressurized reservoir)



Condensate Load produced by Heat Exchanger:
_____ lbs/hr

Motive Steam Pressure (PSIG):

Total Back Pressure (PSIG):

Is there enough clearance under the Heat Exchanger to allow for the Reservoir and preferred Filling Head of 12 inches as illustrated?

Maximum Clearance (inches): _____

To size the PMP, see catalog Pump Capacity chart.

To size the Reservoir, see Reservoir Pipe Length Chart

NON-ELECTRIC CONDENSATE PUMPS

Sizing & Selection Pressure Motive Pumps

Revised 9/2004

Open Loop System (Vented Receiver)

RECEIVER AND VENT SIZING

When sizing a Pressure Motive Pump for an atmospheric return system, the amount of flash steam to be vented through the receiver must be calculated. Vent sizing is critical to maintain zero psig in the receiver tank to allow free drainage of low pressure systems. Undersized vents will cause gradual pressure increase in the receiver. This impedes drainage from the condensate source, and can cause waterlogging of the system.

Usually the condensate load to be pumped comes from multiple sources. For each source determine

the pressure and load. Then go into the Percent Flash Table with the condensate pressure and move right until under the appropriate flash tank pressure to read the percentage of condensate that will flash into steam. Take the source load and multiply it by the decimal value of the percentage to calculate the amount (lbs./hr) of flash steam. Repeat this for all condensate sources. Enter the Vented Receiver Sizing table with the total flash steam load to determine the correct sizes for receiver and vent.

VENTED RECEIVER SIZING – (inches)

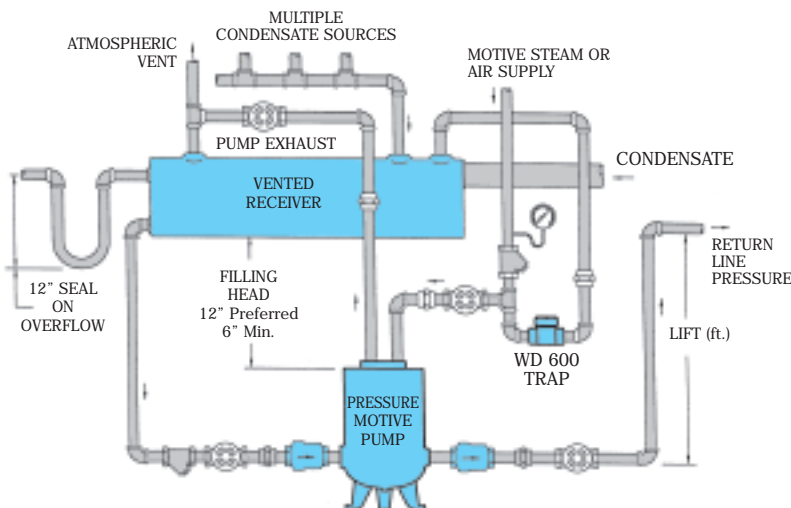
Quantity of Flash Steam (pph)	Receiver Diameter	Receiver Length	Vent Line Diameter
75	4"	36"	1"
150	6"	36"	2"
300	8"	36"	3"
600	10"	36"	4"
900	12"	36"	6"
1200	16"	36"	6"
2000	20"	60"	8"
3000	24"	60"	8"
4000	26"	60"	10"
5000	28"	60"	10"
6000	30"	72"	12"
7000	32"	72"	12"
8000	36"	72"	14"

PERCENT (%) FLASH STEAM

Produced when condensate is discharged to atmosphere or into a flash tank controlled at various pressures

Condensate Pressure (PSIG)	Flash Tank Pressure (PSIG)								
	0	5	10	20	30	40	60	80	100
5	1.6	0.0							
10	2.9	1.3	0.0						
15	3.9	2.4	1.1						
20	4.9	3.3	2.1	0.0					
30	6.5	5.0	3.7	1.7	0.0				
40	7.8	6.3	5.1	3.0	1.4	0.0			
60	10.0	8.5	7.3	5.3	3.7	2.3	0.0		
80	11.8	10.3	9.1	7.1	5.5	4.2	1.9	0.0	
100	13.3	11.8	10.6	8.7	7.1	5.8	3.5	1.6	0.0
125	14.9	13.5	12.3	10.4	8.8	7.5	5.3	3.4	1.8
150	16.3	14.9	13.7	11.8	10.3	9.0	6.8	4.9	3.3
200	18.7	17.3	16.2	14.3	12.8	11.5	9.4	7.6	6.0
250	20.8	19.4	18.2	16.4	14.9	13.7	11.5	9.8	8.2
300	22.5	21.2	20.0	18.2	16.8	15.5	13.4	11.7	10.2
350	24.1	22.8	21.7	19.9	18.4	17.2	15.1	13.4	11.9
400	25.6	24.2	23.1	21.4	19.9	18.7	16.7	15.0	13.5

DATA REQUIRED FOR SIZING PMP IN A OPEN LOOP SYSTEM (vented receiver)



Condensate Load(s):

Source 1: _____ lbs/hr @ _____ psig;

Source 2: _____ lbs/hr @ _____ psig;

Motive Pressure (PSIG): _____

Steam, Air, Other _____ ;

Total Back Pressure (PSIG): _____

Is there enough clearance under the equipment and/or piping to allow for the installation of the Receiver and PMP with the Preferred Filling Head of 12" as illustrated above?

To size the PMP, see Pump Capacity chart.

To size the Vented Receiver, see Vented Receiver Sizing chart.

ELECTRIC PUMPS

W4100/4200

Electric Condensate Pump

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Model	W4100/4200
Tank Sizes	8, 15, 30, 45, 60 & 95 Gallons
Connections	NPT
Tank Material	Carbon Steel or Cast Iron
Options	Mechanical & electrical alternators; gauge glass; thermometer; discharge pressure gauges; isolation valves

Fabricated Steel Receivers (W4100)
Cast Iron Receivers (W4200)



TYPICAL APPLICATIONS

Condensate return systems on low pressure steam applications where the condensate temperatures do not exceed 180°F.

HOW IT WORKS

As condensate flows into the receiver tank of the pump package from the steam system, the tank fills with water. The float on the switch assembly then rises, where it energizes the motor on the pump. Once started, the pump will continue to run until the water level drops below the bottom position of the float switch. There it will de-energized the motor to shut the pump off. This cycle repeats as condensate continues to fill the receiver tank.

FEATURES

- Fabricated steel receivers (W4100) or cast iron receivers (W4200)
- Simplex and duplex packages
- Bronze-fitted centrifugal pumps
- Energy-efficient 3450 RPM motors
- Automatic venting
- Ceramic pump seal
- Heavy-duty float switch
- All steel receivers, and iron receivers over 24 gallons include a threaded NPT overflow port

SAMPLE SPECIFICATION

Pump(s) shall be of the centrifugal type with two-piece enclosed brass impeller, cast iron housing, high temperature (250°F) mechanical seal and stainless steel motor shaft. The float switch shall be two-pole with plastic case, stainless steel float and shafting, and double-break silver contacts. A flat perforated brass strainer shall be provided in the inlet of the pump from the tank.

INSTALLATION

Locate pump as close to the boiler as practical. Place on an elevated, level and substantial foundation in a clean, dry and accessible area. Locate receiver tank inlet below lowest point of the condensate return lines.

MAINTENANCE

At regular intervals, check the motor lubrication, unless the motor is equipped with a permanently lubricated bearing.

OPTIONS

- Mechanical and electrical alternators
- Gauge glass
- Thermometer
- Discharge pressure gauges
- Isolation valves
- Magnetic starters with HOA selector switch
- 1750 RPM motors, larger pumping capacities & higher discharge pressures (30, 40, & 50 psi)
- Wide variety of control panels
- Oversized receivers (45, 60 & 95 gallons)
- Stainless Steel receivers

HOW TO ORDER

Specify the discharge pressure and gallons per minute requirements when ordering.

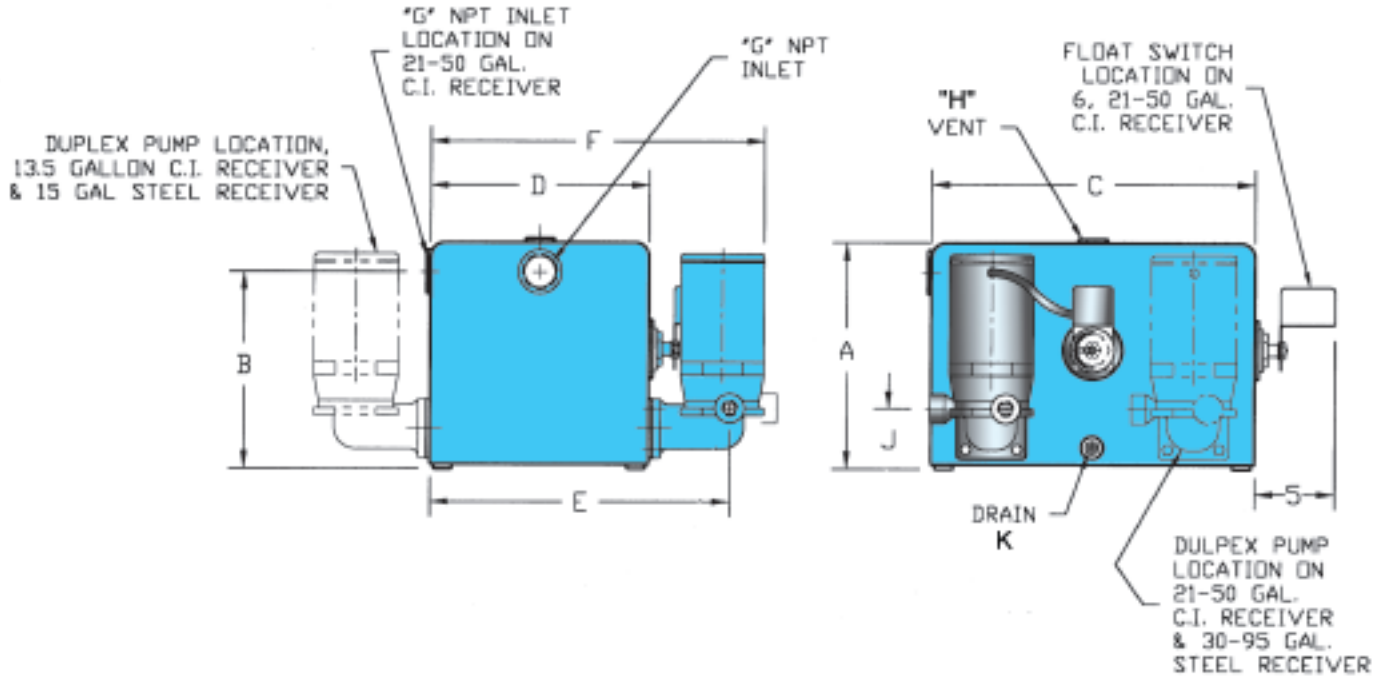
ELECTRIC PUMPS

W4100/4200

Electric Condensate Pump

Revised 9/2004

PUMPS



W4200 (Steel Receiver) (Dimensions-inches)											
Series	Receiver Size	A	B	C	D	E	F	G	H	J	K
G	8 gallon	12 ³ / ₄	10 ¹ / ₂	12 ¹ / ₂	12 ¹ / ₂	18	21 ¹ / ₂	2	1	4 ³ / ₈	1/2
	15 gallon	15 ³ / ₈	13 ³ / ₈	16 ¹ / ₂	15	20 ¹ / ₂	25	2			
	30 gallon	18 ³ / ₈	16 ¹ / ₈	22	18	23 ¹ / ₂	28	2 ¹ / ₂			
J	45 gallon	26 ³ / ₈	24 ¹ / ₈	22	18	---	29 ⁵ / ₁₆	2 ¹ / ₂	1	3 ¹ / ₄	1/2
	60 gallon	28 ³ / ₈	26 ¹ / ₈	28	18	---	29 ⁵ / ₁₆	2 ¹ / ₂			
	95 gallon	28 ³ / ₈	26 ¹ / ₈	28	28	---	39 ⁵ / ₁₆	2 ¹ / ₂			

W4200 (Cast Iron Receiver) (Dimensions-inches)											
Series	Receiver Size	A	B	C	D	E	F	G	H	J	K
G	6 gallon	4 ¹ / ₂	12 ¹ / ₂	14 ¹ / ₂	12 ⁵ / ₈	18 ¹ / ₄	20 ⁷ / ₁₆	2	3/4	4 ³ / ₃₂	3/4
	13.5 gallon	14 ⁷ / ₈	13 ¹ / ₈	18 ¹ / ₂	13 ¹ / ₂	19 ¹ / ₈	24	2	1	3 ³ / ₄	1/2
	21 gallon	19 ¹ / ₈	15 ⁵ / ₈	25 ⁷ / ₈	15	20 ¹ / ₃₂	22 ¹³ / ₁₆	2	1	4 ¹ / ₈	3/4
	36 gallon	18 ⁵ / ₈	15 ¹ / ₈	27 ²¹ / ₆₄	22 ¹ / ₂	27 ¹⁷ / ₃₂	31 ³ / ₄	3	1	4 ¹ / ₈	3/4
J	36 gallon	18 ⁵ / ₈	15 ¹ / ₈	27 ²¹ / ₆₄	22 ¹ / ₂	---	35 ³ / ₈	3	1	4 ³ / ₈	3/4
	50 gallon	18 ⁵ / ₈	15 ¹ / ₈	27 ²¹ / ₆₄	31	---	43 ⁷ / ₈	3	1	4 ³ / ₈	3/4

ELECTRIC PUMPS

W4100

Electric Condensate Pump (Steel Receiver)

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CAPACITIES

EDR	Discharge Pressure (PSIG)	GPM	Motor HP	Receiver Capacity	Simplex Model #	Weight (lbs)	Duplex Model #	Weight (lbs)
8000	20	12	1/3	8	W4028G	90	N/A	N/A
2000	20	3	1/3	15	W4122G	125	W4122GD	185
4000	20	6	1/3	15	W4124G	125	W4124GD	185
6000	20	9	1/3	15	W4126G	125	W4126GD	185
8000	20	12	1/3	15	W4128G	125	W4128GD	185
10000	20	15	1/2	30	W41210G	190	W41210GD	240
15000	20	22.5	1/2	30	W41215G	190	W41215GD	240
20000	20	30	3/4	30	W41220G	200	W41220GD	250
25000	20	37.5	3/4	45	W41225J	285	W41225JD	350
30000	20	45	1	45	W41230J	285	W41230JD	350
40000	20	60	1 1/2	60	W41240J	335	W41240JD	405
50000	20	75	2	95	W41250J	385	W41250JD	460
2000	30	3	1/2	15	W4132J	180	W4132JD	250
4000	30	6	1/2	15	W4134J	180	W4134JD	250
6000	30	9	1/2	15	W4136J	180	W4136JD	250
8000	30	12	1/2	15	W4138J	180	W4138JD	250
10000	30	15	3/4	15	W41310J	185	W41310JD	250
15000	30	22.5	1	30	W41315J	230	W41315JD	300
20000	30	30	1	30	W41320J	230	W41320JD	300
25000	30	37.5	1	45	W41325J	285	W41325JD	350
30000	30	45	1 1/2	45	W41330J	290	W41330JD	355
40000	30	60	2	60	W41340J	340	W41340JD	410
50000	30	75	3	95	W41350J	395	W41350JD	470
2000	40	3	1	15	W4142J	190	W4142JD	270
4000	40	6	1	15	W4144J	190	W4144JD	270
6000	40	9	1	15	W4146J	190	W4146JD	270
8000	40	12	1	15	W4148J	190	W4148JD	270
10000	40	15	1	15	W41410J	190	W41410JD	270
15000	40	22.5	1 1/2	30	W41415J	240	W41415JD	310
20000	40	30	1 1/2	30	W41420J	240	W41420JD	310
25000	40	37.5	1 1/2	45	W41425J	290	W41425JD	355
30000	40	45	2	45	W41430J	295	W41430JD	360
40000	40	60	2	60	W41440J	240	W41440JD	410
50000	40	75	3	95	W41450J	395	W41450JD	470
2000	50	3	2	15	W4152J	195	W4152JD	275
4000	50	6	2	15	W4154J	195	W4154JD	275
6000	50	9	2	15	W4156J	195	W4156JD	275
8000	50	12	2	15	W4158J	195	W4158JD	275
10000	50	15	2	15	W41510J	195	W41510JD	275
15000	50	22.5	2	30	W41515J	245	W41515JD	320
20000	50	30	3	30	W41520J	255	W41520JD	330
25000	50	37.5	3	45	W41525J	305	W41525JD	385
30000	50	45	3	45	W41530J	305	W41530JD	385
40000	50	60	5	60	W41540J	370	W41540JD	500
50000	50	75	5	95	W41550J	430	W41550JD	500

PUMPS

ELECTRIC PUMPS

W4200

Electric Condensate Pump (Cast Iron Receiver)

Revised 9/2004

CAPACITIES								
EDR	Discharge Pressure (PSIG)	GPM	Motor HP	Receiver Capacity	Simplex Model #	Weight (lbs)	Duplex Model #	Weight (lbs)
2000	20	3	1/3	6	W4222G	150	N/A	N/A
4000	20	6	1/3	6	W4224G	150	N/A	N/A
6000	20	9	1/3	13.5	W4226G	260	W4226GD	295
8000	20	12	1/3	13.5	W4228G	260	W4228GD	295
10000	20	15	1/2	13.5	W42210G	260	W42210GD	295
15000	20	22.5	1/2	21	W42215G	300	W42215GD	335
20000	20	30	3/4	36	W42220G	410	W42220GD	445
25000	20	37.5	3/4	36	W42225J	350	W42225JD	420
30000	20	45	1	36	W42230J	355	W42230JD	430
40000	20	60	1 1/2	50	W42240J	420	W42240JD	500
50000	20	75	2	50	W42250J	425	W42250JD	510
2000	30	3	1/2	6	W4232J	165	N/A	N/A
4000	30	6	1/2	6	W4234J	165	N/A	N/A
6000	30	9	1/2	6	W4236J	295	W4236JD	360
8000	30	12	1/2	13.5	W4238J	295	W4238JD	365
10000	30	15	3/4	13.5	W42310J	300	W42310JD	380
15000	30	22.5	1	13.5	W42315J	305	W42315JD	430
20000	30	30	1	21	W42320J	355	W42320JD	430
25000	30	37.5	1	36	W42325J	355	W42325JD	430
30000	30	45	1 1/2	36	W42330J	360	W42330JD	440
40000	30	60	2	50	W42340J	425	W42340JD	510
50000	30	75	3	50	W42350J	235	W42350JD	525
2000	40	3	1	6	W4242J	170	N/A	N/A
4000	40	6	1	6	W4244J	170	N/A	N/A
6000	40	9	1	13.5	W4246J	295	W4246JD	360
8000	40	12	1	13.5	W4248J	295	W4248JD	360
10000	40	15	1	13.5	W42410J	205	W42410JD	360
15000	40	22.5	1 1/2	21	W42415J	310	W42415JD	390
20000	40	30	1 1/2	36	W42420J	360	W42420JD	440
25000	40	37.5	1 1/2	36	W42425J	360	W42425JD	440
30000	40	45	2	36	W42430J	365	W42430JD	510
40000	40	60	2	50	W42440J	425	W42440JD	525
50000	40	75	3	50	W42450J	435	W42450JD	CF
2000	50	3	2	6	W4252J	175	N/A	N/A
4000	50	6	2	6	W4254J	175	N/A	N/A
6000	50	9	2	13.5	W4256J	315	W4256JD	395
8000	50	12	2	13.5	W4258J	315	W4258JD	395
10000	50	15	2	13.5	W42510J	315	W42510JD	395
15000	50	22.5	2	21	W42515J	330	W42515JD	415
20000	50	30	3	36	W42520J	370	W42520JD	460
25000	50	37.5	3	36	W42525J	370	W42525JD	460
30000	50	45	3	36	W42530J	370	W42530JD	460
40000	50	60	5	50	W42540J	445	W42540JD	535
50000	50	75	5	50	W42550J	445	W42550JD	535

PUMPS