



Condensate Management

Pumping Traps

Inside Advantages

Mechanical condensate pumps operate with a spring-assisted float mechanism, which means the springs themselves are a major wear point. Armstrong pumping

traps have large-diameter Inconel X-750 springs, which provide superior corrosion resistance and longer service life than those in competitive models. For other inside advantages, see below.



Notice the difference in spring design from the industry standard spring set (left) and the Armstrong Inconel spring set.

Non-electric

Utilizes inexpensive steam, air or gas for operation and has no seals, motors, impellers or electric components, which frequently fail.

Externally replaceable valve and seat assembly

Maintenance is a "snap" with hardened stainless steel valves that can be cleaned or replaced without cap removal.

Intrinsically safe

due to all-stainless steel construction of mechanism.

Wear and corrosion resistance

Mechanism frame assembly is constructed of rugged investment-cast stainless steel components.

Long life and dependable service

Simple float/spring operation and rugged all-stainless steel construction allow for long, trouble-free service life.

Stress chloride corrosion resistance

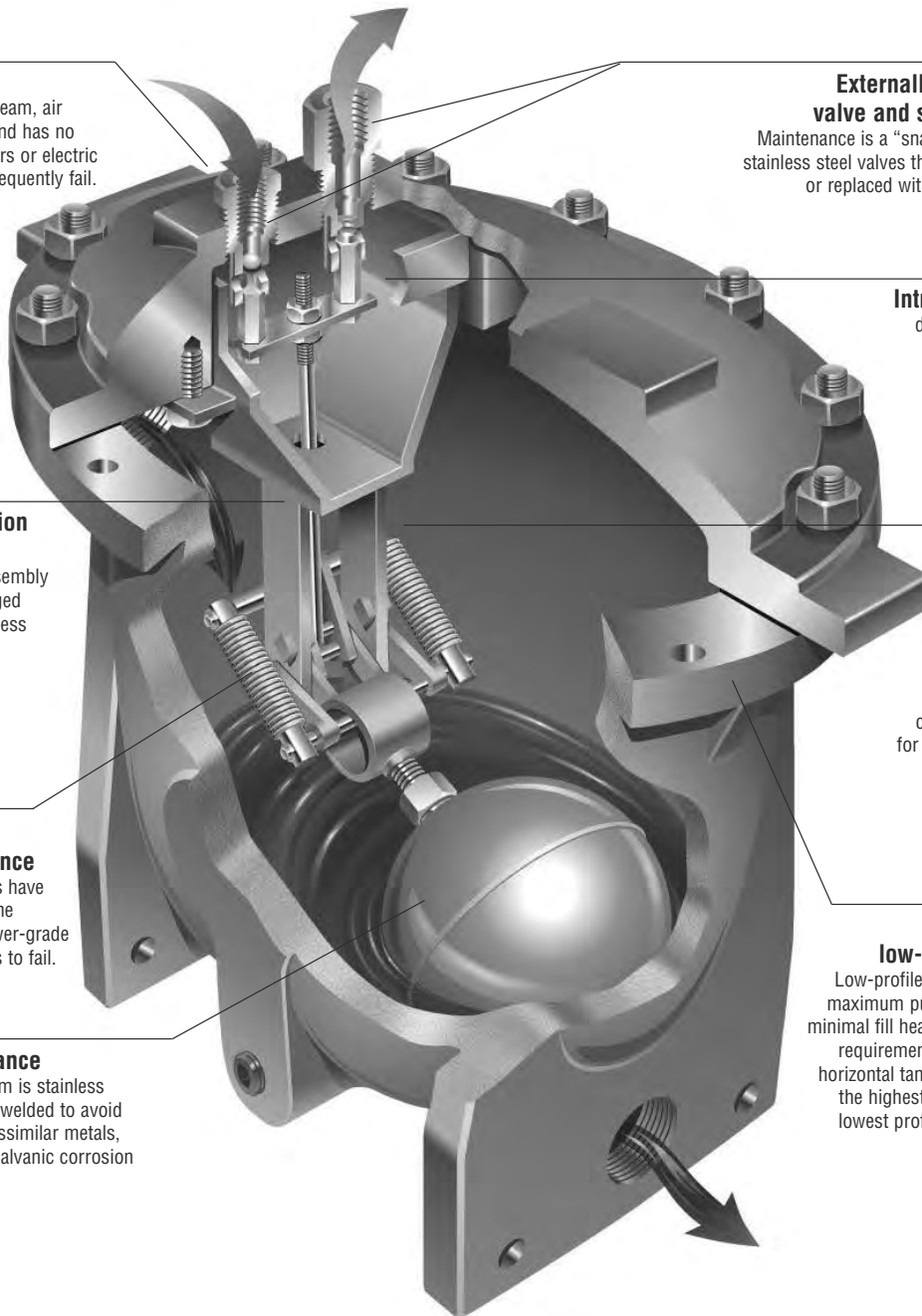
Inconel X-750 springs have higher resistance to the stress that causes lower-grade stainless steel springs to fail.

Compact, low-profile design

Low-profile design allows for maximum pump capacity with minimal fill head and floor space requirements. PT-300 Series horizontal tank design provides the highest capacity with the lowest profile on the market.

Corrosion resistance

Entire float mechanism is stainless steel. Float is Heliarc welded to avoid the introduction of dissimilar metals, which could lead to galvanic corrosion and float failure.



Effective Condensate Management = Energy Savings

The most basic part of energy management is utilizing all valuable Btu within the steam system. Depending on the pressure, condensate exiting a trap contains approximately 20% of the heat energy transferred at the boiler in the form of sensible heat. Effective recovery of condensate reduces three tangible costs of producing steam:

- Fuel/energy costs associated with producing steam
- Boiler water make-up and sewage treatment
- Boiler water chemical treatment

These savings can be calculated using the attached savings form. Returning condensate saves money, energy and the environment. Pour money and energy savings back into your plant—not down the drain.

Condensate Recovery Savings Analysis

Location _____ Bldg _____

Energy costs will vary from plant to plant and regions of the world. Values shown are conservative. Complete this form using your facilities' numbers to determine annual savings in your plant by returning condensate. If some costs are not known, use the figures below for conservative estimates.

A) Condensate Load = **8,000 lb/hr**

B) Annual Hours of Operation = **7,200 hrs per year**

C) Total Water and Sewage Cost = **\$.005 per gal**

c1) Untreated water and sewage = **\$.002 per gal**

c2) Water treatment chemicals = **\$.003 per gal**

D) Make-Up Water Preheating Requirements = **140 Btu/lb**

d1) Condensate Return Temperature = **200°F**

d2) Make-Up Water Temperature = **60°F**

E) Steam Cost = **\$ 5.00/1,000 lb**

F) Annual Water Savings = **\$ 34,532.00**

$$\frac{(A)8000 \times (B)7200 \times (C).005}{8.34 \text{ lb/gal}}$$

G) Savings for Preheating Make-Up Water = **\$ 40,320.00**

$$\frac{(A)8000 \times (B)7200 \times (D)140 \times (E)5.00}{*1000 \times 1000}$$

H) Cost of Steam to Operate†
Armstrong Pump Trap = **\$ 864.00**

$$\frac{3 \times (A)8000 \times (B)7200 \times (E)5.00}{1000 \times 1000}$$

I) Total Dollars Saved Annually (F + G - H) = **\$ 73,988.00**

J) Payback Period in Years = **.27 Years**

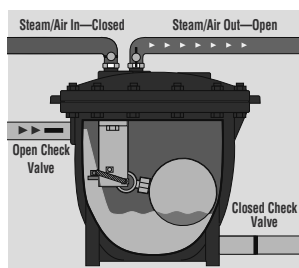
$$\frac{**(\text{cost of equipment/installation}) \$20,000}{(I) 73,988}$$

* Btu/lb from direct steam injection

** Estimated equipment and installation cost

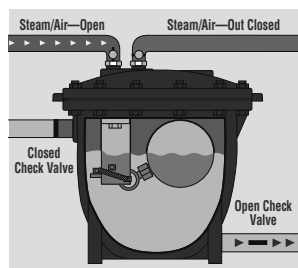
† Cost to operate in example assumes an "open" vented system. If pump trap is used in "closed loop" application, steam operation cost is negligible.

Pumping Trap Operation



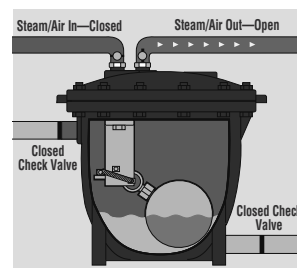
Filling

1. During filling, the steam, air or inert gas inlet and check valve on pumping trap outlet are closed. The vent and check valve on the inlet are open.



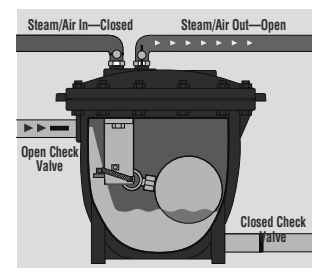
Begin Pumping

2. Float rises with level of condensate until it passes trip point, and then snap action reverses the internal valve positions shown in step one.



End Pumping

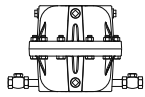

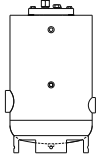
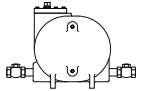
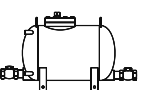
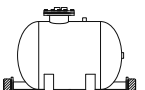
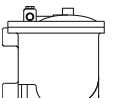
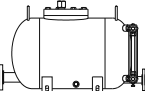
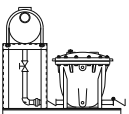
3. Float is lowered as level of condensate falls until snap action again reverses the internal valve positions.



Repeat Filling

4. Steam, air or inert gas inlet and trap outlet are again closed while vent and condensate inlet are open. Cycle begins anew.

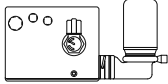
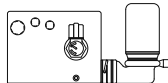

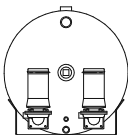
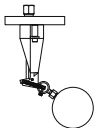
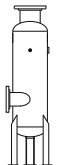
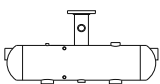
Pumping Trap ID Charts

Illustration	Type	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Mechanism Material	Model	Max. Oper. Press. psig	Capacity Range lb/hr	Connection Size				Located on Page
										1"	1-1/2"	2"	3" x 2"	
	Series PT-100	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-104	100	1,800	●				204
	Series PT-200	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-204	125	2,400	●				206
							PT-206		3,700		●			
	Series PT-400	**Screwed	150	*650	**Fabricated Steel 150 psi ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-404	125	3,600	●				208
	Series PT-400LL	**150# ANSI Flanged					PT-406		5,500		●			219
							PT-408		7,400			●		
							PT-412		12,200				●	
	Series PT-3500	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-3508	125	9,900			●		210
							PT-3512		14,500				●	
	Series PT-300	Screwed	150	*650	**Fabricated Steel 150 psi ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-308	125	11,600			●		212
	Series PT-300LL	**150# ANSI Flanged		550					16,600					219
		**300# ANSI Flanged											●	
	Series PT-500	**150# ANSI Flanged	150	500	**Fabricated Steel 150 psi ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-516	150	80,000	4" x 4"				216
	Double Duty® 4	Screwed	72	320	Ductile Iron	Stainless Steel	Simplex	72	up to 350	1" x 1"				220
							Duplex							
	Double Duty® 6	**150# ANSI Flanged	200	400	Carbon Steel	Stainless Steel with Inconel X-750 Spring	Simplex	200	up to 4,800	1-1/2" x 1"				222
	Double Duty® 12						Duplex		up to 19,900	3" x 3"				224
							Triplex							
	Series 100, 200, 300, 3500 Low Boy™ Packages	For detailed information, regarding Armstrong pre-piped pump packages, please contact the factory or visit our website at armstronginternational.com												

**Other connection type, receiver pressure vessel ratings and material type available upon request—consult factory.

*Standard mechanism: Maximum motive 125 psi; maximum allowable pressure 150 psi (vessel rating); maximum temperature 480°F (vessel rating).

Pumping Trap ID Charts

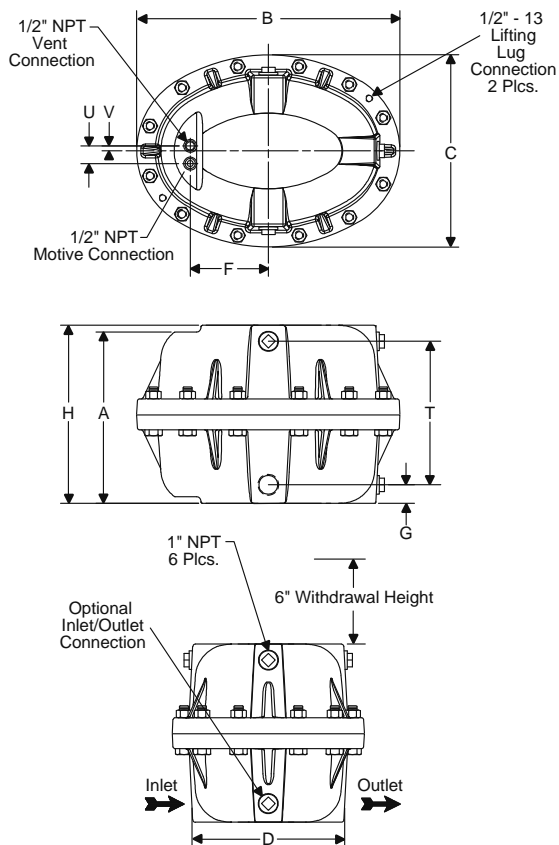
Electric Centrifugal Condensate Pump ID Chart										
Illustration	Type	Sq. Ft. EDR	Pump Capacity GPM	Pump Disch. Press.	Motor HP	RPM	Disch. Size Inches	Inlet Size Inches	Receiver Cap. Gallons	Locate Page for Sizing
	FHS Series	8,000 thru 20,000	12 thru 30	Max. 20 psig	Simplex 1/3, 1/2, 3/4	3,500 RPM Only Single Phase Only	3/4"	2" thru 3"	FHS Series 8 - 30 (Steel)	234
	FHC Series Simplex or Duplex				Duplex 1/2 or 3/4				FHC Series 15 - 36 (Cast Iron)	
	AFH-4100 4200 4300 3500	2,000 thru 50,000	*3 thru 75	*20 thru 50	*1/3 thru 5	1,750 and 3,500	3/4" thru 1-1/2"	2" thru 4"	AFH-4100/4300 8 - 120 (Steel/SS)	237 thru 246
	Simplex or Duplex					Single or Three Phase			AFH-4200 6 - 120 (Cast Iron)	
	AFH-4400 Simplex or Duplex	4,000 thru 60,000	6 thru 90	*10 thru 50	1/3 thru 1-1/2"	3500 RPM	3/4" thru 1-1/2"	2" thru 2-1/2"	12 - 100	247
Boiler Feed Condensate Pump ID Chart										
Illustration	Type	Boiler HP BHP	Pump Capacity GPM	Pump Disch. Press.	Motor HP	RPM	Disch. Size Inches	Inlet Size Inches	Receiver Cap. Gallons	Locate Page for Sizing
	AFH-4100 4200 4300 **3500 5000	15 to 700	*3 to 140	*20 to 50	1/3 to 7-1/2	1,750 and 3,500 Single or Three Phase	Consult Factory		30 to 714	242
Rescue Cap® Non-Electric Steam/Air Powered Pump Retrofit Assembly ID Chart										
Illustration	Fits Competitors' Mechanical Pumps Listed Below								Page	
	Spirax Sarco Models PPC & PPF PTC & PTF	Watson McDaniel Models PMPC & PMP	Spence & Nicholson Condensate Commanders	KADANT-Johnson Corporation	ITT Hoffman PCS	Yarway Series 65 Steel	Clark Reliance		232	
Flash Tank ID Chart										
	Type	Connections	Size	Pressure Rating	Sparge Pipe	Body Material	Page			
	VAFT Vertical Flash Tanks	NPT Flanged	6" 8" 12" 16"	***150 psig	N/A	Carbon Steel	253			
	HAFT Horizontal Flash Tanks	NPT Flanged	4" thru 30"				255			

*Other capacities, discharge pressures and HP available - consult factory.

**3500 Series has elevated tank as standard.

***Other pressure ratings available upon request.

PT-104 Series Mini Pump Trap



The patented Armstrong PT-104 Mini Pump Trap is the smallest non-electric solution that can move condensate or other liquids from lower to higher points and from lower to higher pressures. Condensate can be returned at temperatures well above the 200°F (93°C) limit of conventional electric centrifugal pumps without the headaches of leaking seals or cavitation problems. The PT-104 Mini Pump Trap is the small solution for a big problem.

Features

- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Cast iron durability. Rugged construction material means long service life.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.

For a fully detailed certified drawing, refer to CDF #1028.

PT-104 Mini Pump Trap Physical Data

Symbol	in	mm
"A"	12	305
"B"	18-1/2	470
"C"	13-1/2	343
"D"	10-3/4	272
"F"	5-1/2	140
"G"	1-5/16	33
"H"	12-1/2	317
"U"	1-1/4	32
"V"	3/8	9
"T"	10-1/16	256
Weight lb (kg)	140 (64)	
Bronze Check Valves lb (kg)	4 (2)	
Stainless Steel Check Valve lb (kg)		
Maximum Operating Pressure	100 psig (7 bar)	
Maximum Allowable Pressure (vessel design)	150 psig @ 450°F (10 bar @ 232°C)	

PT-104 Mini Pump Trap Connection Sizes

Connection	Type	in	mm
Inlet	NPT	1	25
Outlet		1	25
Vent		1/2	15
Motive Pressure		1/2	15
Optional Gauge Glass		1	25
Optional Cycle Counter/Pressure Gauge		1	25

PT-104 Mini Pump Trap Materials

Name of Part	Material
Body and Cap	Cast iron ASTM A48 Cl.30
Vent/Inlet Valves	Stainless steel
Mechanism Assembly	Stainless steel
Spring	Inconel X-750
Gasket	Graphoil
Bolts	SA 449
Nuts	ASTM A194 Gr.2H
Plug	Cast iron

PT-104 Series Mini Pump Trap

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
 - NPT Bronze ASTM B 62
 - Teflon® Disc
 - Class 150 (Minimum)
- Outlet
 - Stainless Steel Check Valve
 - Class 150 (Minimum)
- In-line Check Valves
 - Stainless Steel Non-Slam Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

Capacity Conversion Factors for Other Filling Heads

Filling Head				
in	0	6	12	* 24 or greater
mm	0	150	305	* 620 or greater
PT-104 Mini Pump Trap	0.7	1.0	1.2	* Consult factory

NOTE: Fill head measured from drain to top of cap. See figures on page 228.

PT-104 Mini Pump Trap Capacities

Motive Pressure		Total Lift or Back Pressure		Filling Head 6" (152 mm) Liquid Specific Gravity .09 - 1.0			
				Steam		Air	
				lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	1,125	510	2,100	952
25	1.7			1,300	590	2,200	998
50	3.5			1,550	703	2,275	1,032
75	5.0			1,650	748	2,300	1,043
100	7.0			1,400	635	2,350	1,066
25	1.7	15	1.0	650	295	1,900	862
50	3.5			700	363	2,050	930
75	5.0			750	317	2,100	952
100	7.0			800	340	2,150	975
35	2.5	25	1.5	400	181	1,800	816
50	3.5			450	204	1,935	878
75	5.0			500	227	2,050	930
100	7.0			550	249	2,075	941
50	3.5	40	3.0	250	113	1,620	735
75	5.0			300	136	1,850	823
100	7.0			350	159	1,950	884

NOTE: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump case. See figures on page 228.

PT-200 Series Low Profile Cast Iron Pump Trap



The Armstrong PT-200 Series Low Profile Pump Trap is a low maintenance, non-electric solution to move condensate or other liquids from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. Condensate can be returned well above the 200°F (93°C) limit of conventional electric condensate pumps without the headaches of leaking seals or cavitation problems.

Features

- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Cast iron durability. Rugged construction material means long service life.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
 - NPT Bronze ASTM B 62
 - Teflon® Disc
 - Class 150 (Minimum)
- Outlet
 - Stainless Steel Check Valve
 - Class 150 (Minimum)
- In-line Check Valves
 - Stainless Steel Non-Slam Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

For a fully detailed certified drawing, refer to CDF #1000.



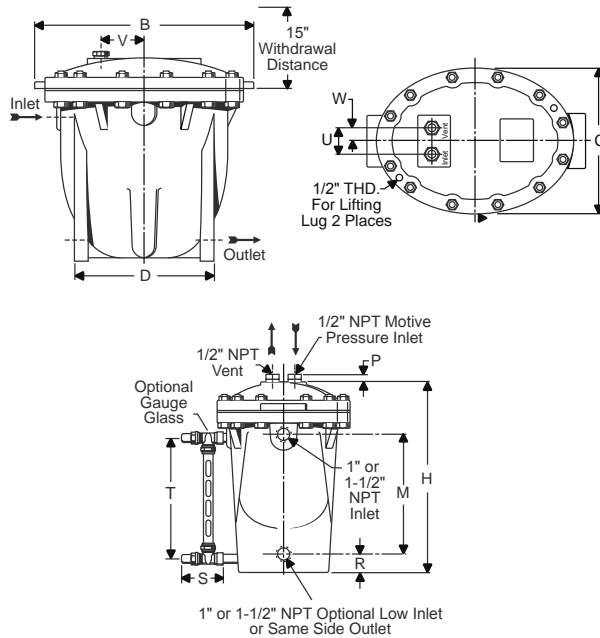
PT-200 Pumping Trap Materials

Name of Part	Series PT-200
Body and Cap	Cast iron ASTM A48 Cl. 30
Cap Gasket	Graphoil
Bolts	SA-449 Steel
Nuts	Alloy steel ASTM A194 Gr. 2H
Inlet Valve Assembly	Stainless steel
Vent Valve Assembly	Stainless steel
Valve Assembly Washers	Zinc plated steel
Plug	Steel
Mechanism Assembly	Stainless steel
Springs	Inconel X-750

PT-200 Pumping Trap Connection Sizes

Model	Cast Iron			
	PT-204		PT-206	
	in	mm	in	mm
Inlet Connection	1	25	1-1/2	40
Outlet Connection	1	25	1-1/2	40
Optional Low Inlet or Same Side Outlet Connection	1	25	1-1/2	40
Motive Pressure Connection	1/2	15	1/2	15
Vent Connection	1/2	15	1/2	15
Gauge Glass Connection	1/2	15	1/2	15

PT-200 Series Low Profile Cast Iron Pump Trap



PT-200 Pumping Trap Physical Data

	PT-204 PT-206	
	in	mm
"B"	20-7/16	519
"C"	13-1/2	342
"D"	12-15/16	328
"H"	19	482
"M"	11-35/64	293
"P"	23/32	18
"R"	2-1/32	51
"S"	4-3/8	111
"T"	12	305
"U"	2-1/4	57
"V"	4-1/8	104
"W"	1-1/8	28
Weight lb (kg)	210 (96)	
Number of Body/Cap Bolts	12	
Check Valve Conn. in (mm)	1 (25)	1-1/2 (40)
Bronze Check Valves lb (kg)	4 (2)	9 (4)
Stainless Steel Check Valves lb (kg)	4 (2)	9 (4)

Maximum Allowable Pressure (Vessel Design) 150 psig @ 450°F (10 bar @ 232°C)
Maximum Operating Pressure 125 psig (9 bar)

PT-200 Capacity Conversion Factors for Other Fill Heads

Fill Head		in	mm	in	mm	in	mm	in	mm	in	mm
		0	0	6	152	12	305	24	610	36	914
Model	PT-204	0.7		1		1.1		1.3		1.4	
	PT-206	0.7		1		1.1		1.3		1.4	

NOTE: Fill head is measured from drain point to top of cap. See figures on page 228.

PT-200 Pumping Trap Capacities

Motive Pressure		Total Lift or Back Pressure		PT-204 (6" Fill Head) 1" x 1"				PT-206 (6" Fill Head) 1-1/2" x 1-1/2"			
				Steam Motive		Air Motive		Steam Motive		Air Motive	
				lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	1,800	816	2,100	953	2,700	1,225	3,000	1,361
25	1.7			2,025	919	2,300	1,043	3,200	1,451	3,500	1,588
50	3.5			2,100	953	2,500	1,134	3,400	1,542	3,600	1,633
75	5			2,200	998	2,700	1,225	3,500	1,588	3,700	1,678
100	7			2,300	1,043	*	*	3,600	1,633	*	*
125	8.5			2,400	1,089	*	*	3,700	1,678	*	*
25	1.7	15	1	1,500	680	2,000	907	2,400	1,088	2,700	1,225
50	3.5			2,000	907	2,250	1,021	3,200	1,451	3,400	1,542
75	5			2,100	953	2,500	1,134	3,300	1,497	3,500	1,588
100	7			2,110	957	*	*	3,350	1,520	*	*
125	8.5			2,125	964	*	*	3,400	1,542	*	*
35	2.5	25	1.5	1,500	680	1,700	771	2,100	953	2,300	1,043
50	3.5			1,700	771	2,000	907	2,400	1,089	2,600	1,179
75	5			1,900	862	2,300	1,043	2,700	1,225	2,900	1,315
100	7			2,000	907	*	*	2,800	1,270	*	*
125	8.5			2,100	953	*	*	2,900	1,315	*	*
50	3.5	40	3	1,400	635	1,700	771	1,500	680	2,000	907
60	4			1,500	680	2,000	907	2,000	907	2,300	1,043
75	5			1,700	771	2,200	998	2,300	1,043	2,500	1,134
100	7			1,800	816	*	*	2,400	1,089	*	*
125	8.5			1,920	871	*	*	2,500	1,134	*	*
70	4.5	60	4	1,100	499	2,000	907	1,150	522	2,000	907
75	5			1,300	590	2,300	1,043	1,325	601	2,300	1,043
100	7			1,600	726	*	*	1,900	862	*	*
125	8.5			1,720	780	*	*	2,000	907	*	*

NOTES: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump cap. See figures on page 228.

Although motive pressures are shown at high pressure differentials (difference between motive inlet pressure and total lift or back pressure), it is preferable to use a motive pressure of 10 - 15 psig (0.65 - 1.0 bar) above discharge (outlet) pressure. This ensures longevity of economical (bronze) check valves and reduces both venting time and temperature differential (on steam). If a higher differential is used, stainless steel check valves are recommended.

*Consult factory.

PT-400 Series Vertical Steel Pump Trap

The Armstrong PT-400 Series Vertical Pump Trap is the low maintenance, non-electric solution to move condensate or other liquids from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. Condensate can be returned at temperatures well above the 200°F (93°C) limit of conventional electric condensate pumps without the headaches of leaking seals or cavitation problems.

Features

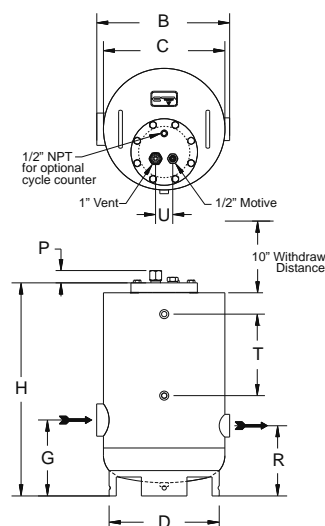
- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Durable construction. ASME code-stamped carbon steel body vessel.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
 - NPT Bronze ASTM B 62
 - Teflon® Disc
 - Class 150 (Minimum)
- Outlet
 - Stainless Steel Check Valve
 - Class 150 (Minimum)
- In-line Check Valves
 - Stainless Steel Non-Slam Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

For a fully detailed certified drawing, refer to CDF #1004.



PT-400 Pumping Trap Physical Data				
Model Number	PT-404, PT-406, PT-408 and PT-412			
	in		mm	
"B"	17-1/2		445	
"C"	16		406	
"D"	14-1/2		368	
"G"	10		254	
"H"	28		711	
"P"	1-5/8		41	
"R"	9-1/4		235	
"T"	12		305	
"U"	2-1/4		57	
Weight, lb (kg)	166 (75)			
Number of Body/Cap Bolts	8			
Model Number	PT-404	PT-406	PT-408	PT-412
Check Valve Conn., in (mm)	1 (25)	1-1/2 (40)	2 (50)	3 (75)
Bronze Check Valves, lb (kg)	4 (2)	9 (4)	16 (7)	29 (13)
Stainless Steel Check Valves, lb (kg)	4 (2)	9 (4)	15 (7)	38 (17)

PT-400 Series Vertical Steel Pump Trap

PT-400 Pumping Trap Connection Sizes

Model		Vertical Steel							
		PT-404		PT-406		PT-408		PT-412	
		in	mm	in	mm	in	mm	in	mm
Inlet	ction Conne	1	25	1-1/2	40	2	50	3	80
Outlet	ction Conne	1	25	1-1/2	40	2	50	2	50
Motive Pressure Connection		1/2	15	1/2	15	1/2	15	1/2	15
Vent	ction Conne	1	25	1	25	1	25	1	25
Gauge Glass Connection		1/2	15	1/2	15	1/2	15	1/2	15

NOTES: Optional flanged connections available. Consult factory. Inlet/outlet socketweld connections available. Consult factory.

PT-400 Pumping Trap Capacities

Motive Pressure		Total Lift or Back Pressure		PT-404 (12" Fill Head) 1" x 1"				PT-406 (12" Fill Head) 1-1/2" x 1-1/2"				PT-408 (12" Fill Head) 2" x 2"				PT-412 (12" Fill Head) 3" x 2"			
				Steam Motive		Air Motive		Steam Motive		Air Motive		Steam Motive		Air Motive		Steam Motive		Air Motive	
				lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	1,900	862	2,250	1,021	3,100	1,406	3,350	1,520	4,500	2,041	4,850	2,200	7,500	3,402	8,100	3,674
25	1.7			2,500	1,134	2,650	1,202	4,600	2,086	4,875	2,211	6,600	2,994	7,000	3,175	11,000	4,990	11,650	5,284
50	3.5			3,100	1,406	3,225	1,463	4,900	2,222	5,100	2,313	7,100	3,220	7,375	3,345	11,700	5,307	12,150	5,511
75	5			3,400	1,542	3,500	1,588	5,200	2,359	5,300	2,404	7,200	3,266	7,400	3,357	12,000	5,443	12,350	5,602
100	7			3,500	1,588	*	*	5,400	2,449	*	*	7,300	3,311	*	*	12,100	5,488	*	*
125	8.5			3,600	1,633	*	*	5,500	2,495	*	*	7,400	3,357	*	*	12,200	5,534	*	*
25	1.7	15	1	2,200	999	2,525	1,145	3,500	1,588	4,025	1,826	5,400	2,449	6,200	2,812	7,200	3,266	8,275	3,753
50	3.5			2,600	1,179	2,800	1,270	4,100	1,860	4,425	2,007	6,300	2,857	6,800	3,084	10,400	4,717	11,250	5,103
75	5			2,800	1,270	2,950	1,338	4,400	1,996	4,750	2,155	6,500	2,948	6,900	3,130	10,800	4,899	11,450	5,194
100	7			3,100	1,406	*	*	4,800	2,177	*	*	6,700	3,039	*	*	11,000	4,990	*	*
125	8.5			3,200	1,451	*	*	4,900	2,222	*	*	6,800	3,084	*	*	11,200	5,080	*	*
35	2.5	25	1.5	2,000	907	2,350	1,066	2,900	1,315	3,425	1,554	4,200	1,905	4,950	2,245	6,900	3,130	8,150	3,697
50	3.5			2,400	1,088	2,675	1,213	4,000	1,814	4,500	2,041	5,800	2,631	6,400	2,903	9,700	4,400	10,850	4,921
75	5			2,600	1,179	2,800	1,270	4,300	1,950	4,550	2,064	6,000	2,721	6,500	2,948	10,000	4,536	10,900	4,944
100	7			2,800	1,270	*	*	4,700	2,132	*	*	6,100	2,767	*	*	10,200	4,626	*	*
125	8.5			2,900	1,315	*	*	4,800	2,171	*	*	6,400	2,903	*	*	10,400	4,717	*	*
50	3.5	40	3	1,900	862	2,350	1,066	3,300	1,451	4,050	1,837	4,350	1,973	5,350	2,427	5,800	2,631	7,125	3,232
60	4			2,200	999	2,600	1,179	3,600	1,633	4,250	1,927	5,100	2,313	6,000	2,722	6,900	3,130	8,150	3,697
75	5			2,400	1,088	2,675	1,213	4,000	1,814	4,475	2,030	5,700	2,585	6,375	2,892	7,600	3,447	8,500	3,856
100	7			2,500	1,135	*	*	4,200	1,905	*	*	6,000	2,721	*	*	8,100	3,674	*	*
125	8.5			2,700	1,225	*	*	4,500	2,041	*	*	6,200	2,612	*	*	8,500	3,856	*	*
70	4.5	60	4	1,800	816	2,400	1,088	3,200	1,451	4,300	1,950	3,800	1,724	5,050	2,291	5,000	2,268	6,650	3,016
75	5			2,000	907	2,450	1,111	3,500	1,588	4,650	2,109	4,100	1,859	5,175	2,347	5,400	2,450	6,900	3,130
100	7			2,300	1,233	*	*	3,700	1,678	*	*	4,500	2,041	*	*	6,000	2,722	*	*
125	8.5			2,400	1,088	*	*	3,800	1,724	*	*	4,800	2,177	*	*	6,400	2,903	*	*

NOTES: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump cap. See figures on page 228. Although motive pressures are shown at high pressure differentials (difference between motive inlet pressure and total lift or back pressure), it is preferable to use a motive pressure of 10 - 15 psig (0.65 - 1 bar) above discharge (outlet) pressure. This ensures longevity of economical (bronze) check valves and reduces both venting time and temperature differential (on steam). If a higher differential is used, stainless steel check valves are recommended.

*Consult factory.

PT-400 Series Pumping Trap Materials

Name of Part	Series PT-400*
Body and Cap	Fabricated steel 150 psi ASME Sec. VIII design "U" stamped
Cap Gasket	Graphoil
Bolts	SA-449 steel
Nuts	None
Inlet Valve Assembly	Stainless steel
Vent Valve Assembly	Stainless steel
Valve Assembly Washers	Zinc-plated steel
Plug	Steel
Mechanism Assembly	Stainless steel
Springs	Inconel X-750

*Series PT-400 is available in all stainless steel. Consult factory.

PT-400 Capacity Conversion Factors for Other Fill Heads

Fill Head		in	mm	in	mm	in	mm	in	mm	in	mm
		0	0	6	152	12	305	24	610	36	914
Model	PT-404	0.7		0.85		1.0		1.3		1.4	
	PT-406	0.7		0.85		1.0		1.2		1.35	
	PT-408	0.7		0.85		1.0		1.2		1.35	
	PT-412	0.7		0.85		1.0		1.08		1.2	

NOTES: Fill head is measured from drain point to top of cap. See figures on page 228.

PT-3500 Series Low Profile Pump Trap



The Armstrong PT-3500 Series Low Profile Pump Trap is the low maintenance, non-electric solution to move condensate or other liquids from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. Condensate can be returned at temperatures well above the 200°F (93°C) limit of conventional electric pumps without the headaches of leaking seals or cavitation problems.

Features

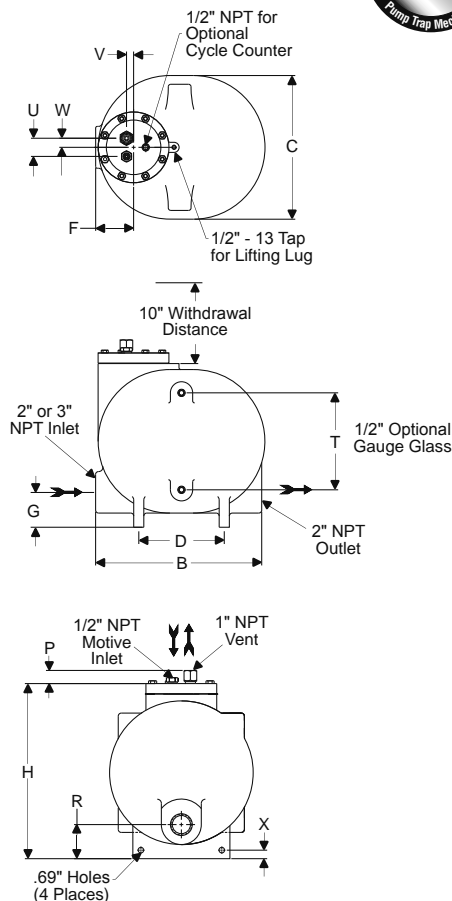
- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Cast iron durability. Rugged construction material means long service life.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
NPT Bronze ASTM B 62
Teflon® Disc
Class 150 (Minimum)
- Outlet
Stainless Steel Check Valve
Class 150 (Minimum)
- In-line Check Valves
Stainless Steel Non-Slam Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

For a fully detailed certified drawing, refer to CDF #1041.



PT-3500 Series Pump Trap Physical Data

	PT-3508 and PT-3512	
	in	mm
"B"	20-1/4	514
"C"	17-3/4	451
"D"	10-9/16	268
"F"	4-3/4	120
"G"	4-5/16	110
"H"	21-11/16	550
"P"	1-5/8	41
"R"	4-5/16	110
"T"	12	305
"U"	2-1/4	27
"V"	7/8	22
"W"	1-1/4	32
"X"	1-1/16	27
Weight		PT-3508 PT-3512
Pump Trap Weight	lb (kg)	244 (111) 243 (110)
Bronze Check Valve		16 (7) 29 (13)
Stainless Check Valve		15 (7) 38 (17)

Maximum Operating Pressure: 125 psig (9 bar)

Maximum Allowable Pressure: Cast iron 150 psig @ 450°F (10 bar @ 232°C)

PT-3500 Series Low Profile Pump Trap

PT-3500 Series Low Profile Pump Trap Capacities											
Operating Inlet Pressure		Total Lift or Back Pressure		Filling Head 12" (305 mm) Liquid Specific Gravity 0.09 - 1.0							
				PT-3508 2" x 2"				PT-3512 3" x 2"			
				Steam		Air		Steam		Air	
psig	bar	psig	bar	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	6,100	2,767	8,100	3,674	8,300	3,765	10,300	4,627
25	1.7			8,700	3,946	9,300	4,818	12,100	5,489	12,950	5,874
50	3.5			8,900	4,037	9,675	4,389	13,400	6,078	14,000	6,350
75	5			9,200	4,173	9,800	4,452	13,700	6,214	14,300	6,486
100	7			9,400	4,264	*	*	14,000	6,350	*	*
125	8.5			9,900	4,491	*	*	14,400	6,532	*	*
25	1.7	15	1	6,300	2,858	8,200	3,719	8,100	3,674	9,800	4,445
50	3.5			8,200	3,719	10,400	4,717	11,600	5,262	12,600	5,715
75	5			9,200	4,173	11,100	5,035	12,500	5,670	13,300	6,033
100	7			9,600	4,354	*	*	12,600	5,715	*	*
125	8.5			9,800	4,445	*	*	13,400	6,078	*	*
35	2.5	25	15	6,100	2,767	7,900	3,583	7,600	3,447	9,900	4,491
50	3.5			7,100	3,221	9,600	4,355	10,000	4,536	10,650	4,831
75	5			8,600	3,901	10,800	4,899	11,200	5,080	12,200	5,534
100	7			8,700	3,946	*	*	11,450	5,194	*	*
125	8.5			9,100	4,128	*	*	11,600	5,262	*	*
50	3.5	40	3	5,000	2,268	6,500	2,948	6,200	2,812	8,500	3,856
60	4			5,900	2,676	7,400	3,357	7,700	3,493	9,400	4,264
75	5			6,650	3,016	8,300	3,765	8,700	3,946	10,600	4,800
100	7			7,200	3,266	*	*	9,100	4,128	*	*
125	8.5			7,800	3,538	*	*	9,400	4,264	*	*
75	5	60	4	4,500	2,042	6,300	2,858	5,900	2,676	8,700	3,946
100	7			5,500	2,495	*	*	6,500	2,948	*	*
125	8.5			5,700	2,586	*	*	6,900	3,130	*	*

NOTES: Published capacities based on use of external check valves supplied by Armstrong. Although motive pressures are shown at high pressure differential (difference between motive inlet pressure and total lift or back pressure), it is preferable to use a motive pressure of 10 - 15 psig (0.65 - 1.0 bar) above discharge (outlet) pressure. This ensures longevity of economical (brass) check valves and reduces both venting time and temperature differential (on steam). Shading indicates sizing example shown on page 214.

*Consult factory.

PT-3500 Capacity Conversion Factors for Other Fill Heads													
Fill Head		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
		0	0	6	152	12	305	18	457	24	610	36	914
Model	PT-3508	0.7		0.85		1.0		1.1		1.2		1.35	
	PT-3512	0.7		0.85		1.0		1.04		1.08		1.2	

NOTE: Fill head measured from drain point to top of cap. See figures on page 228.

PT-3500 Series Low Profile Pump Trap Materials	
Name of Part	Material
Body	Cast iron - ASTM A48 class 30
Cap	Carbon steel SA-516-70
Cap Gasket	Graphoil
Inlet Valve Assembly	Stainless steel
Vent Valve Assembly	Stainless steel
Valve Assembly Washers	Zinc-plated steel
Plug	Steel
Mechanism Assembly and Float	Stainless steel
Springs	Inconel X-750

PT-3500 Series Low Profile Pump Trap Connection Sizes					
Model Number		PT-3508		PT-3512	
		in	mm	in	mm
Inlet	Connection	2	50	3	75
Outlet	Connection	2	50	2	50
Motive Pressure Connection		1/2	15	1/2	15
Vent	Connection	1	25	1	25
Gauge Glass Connection		1/2	15	1/2	15

PT-300 Series Horizontal Steel, Low Profile Pump Trap

The Armstrong PT-300 Series Horizontal, Low Profile Pump Trap is the low maintenance non-electric solution to move condensate or other liquids from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. Condensate can be returned at temperatures well above the 200°F (93°C) limit of conventional electric condensate pumps without the headaches of leaking seals or cavitation problems.

Features

- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Durable construction. ASME code-stamped carbon steel body vessel.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.

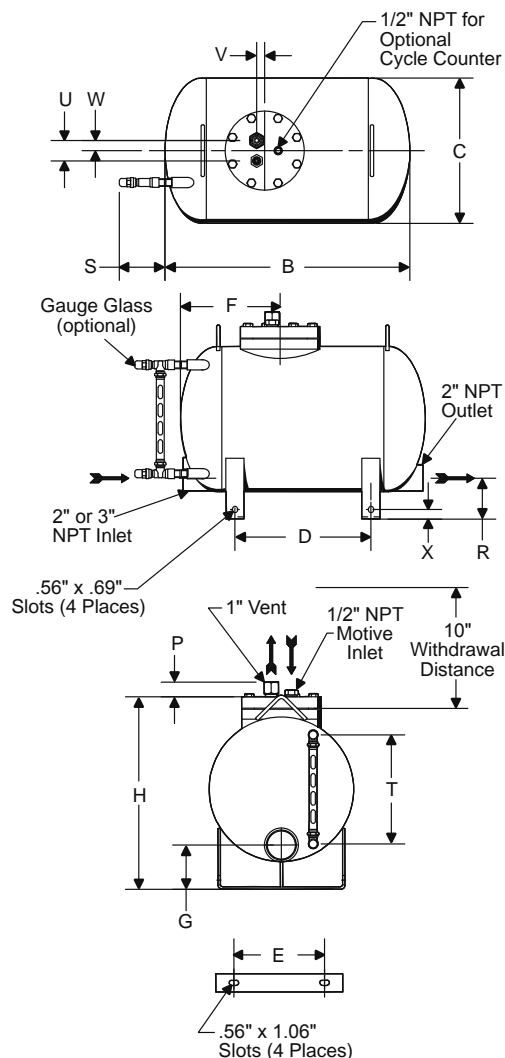
PT-300 Pumping Trap Physical Data

Model Number	PT-308 PT-312	
	in	mm
"B"	27	686
"C"	16	406
"D"	15	381
"E"	10	254
"F"	11	279
"G"	5-7/16	138
"H"	21-3/16	538
"P"	1-5/8	41
"R"	4-13/16	122
"S"	5-1/32	128
"T"	12	305
"U"	2-1/4	57
"V"	7/8	22
"W"	1-1/4	32
"X"	1-1/16	27
Face to Face	27-1/2*	698
Weight lb (kg)	154 (70)	
Number of Body/Cap Bolts	8	
Check Valve Conn. in (mm)	2 (50)	3 (75)
Bronze Check Valves lb (kg)	16 (7)	29 (13)
Stainless Steel Check Valves lb (kg)	15 (7)	38 (17)

Maximum Allowable Pressure (Vessel Design): 150 psig @ 650°F (10 bar @ 343°C)

Maximum Operating Pressure: 125 psig (9 bar)

*Tolerance +/- 1/2"



For a fully detailed certified drawing, refer to CDF #1001.

PT-300 Series Horizontal Steel, Low Profile Pump Trap

PT-300 Pumping Trap Materials	
Name of Part	Series PT-300*
Body and Cap	Fabricated steel 150 psi ASME Sec. VIII design "U" stamped
Cap Gasket	Graphoil
Bolts	SA-449 steel
Nuts	None
Inlet Valve Assembly	Stainless steel
Vent Valve Assembly	Stainless steel
Valve Assembly Washers	Zinc plated steel
Plug	Steel
Mechanism Assembly	Stainless steel
Springs	Inconel X-750

NOTES: Optional flanged or socketweld connections available. Consult factory.

*Series PT-300 is available in all stainless steel. Consult factory.

PT-300 Pumping Trap Connection Sizes				
Model	Horizontal Steel			
	PT-308		PT-312	
	in	mm	in	mm
Inlet Connection	2	50	3	80
Outlet Connection	2	50	2	50
Motive Pressure Connection	1/2	15	1/2	15
Vent Connection	1	25	1	25
Optional Gauge	1/2	15	1/2	15

PT-300 Pumping Trap Capacities											
Motive Pressure		Total Lift or Back Pressure		PT-308 (12" Fill Head) 2" x 2"				PT-312 (12" Fill Head) 3" x 2"			
				Steam Motive		Air Motive		Steam Motive		Air Motive	
psig	bar	psig	bar	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5.0	34	6,900	3,130	9,200	4,173	9,000	4,082	12,300	5,579
25	1.7			10,200	4,622	10,900	4,944	13,200	5,987	14,200	6,441
50	3.5			10,600	4,808	11,100	5,035	15,100	6,849	15,800	7,167
75	5			10,800	4,898	11,300	5,126	15,300	6,940	16,100	7,303
100	7			11,200	5,080	*	*	15,500	7,031	*	*
125	8.5			11,600	5,261	*	*	16,600	7,530	*	*
25	1.7	15	1	7,000	3,175	10,100	4,581	9,000	4,082	11,200	5,080
50	3.5			9,600	4,354	10,900	4,944	12,800	5,806	13,800	6,260
75	5			10,750	4,876	11,100	5,035	14,200	6,441	15,000	6,804
100	7			10,900	4,944	*	*	14,300	6,486	*	*
125	8.5			11,300	5,125	*	*	15,100	6,849	*	*
35	2.5	25	1.5	7,100	3,221	9,200	4,173	8,100	3,674	11,500	5,216
50	3.5			8,300	3,765	10,200	4,627	10,200	4,627	12,750	5,783
75	5			10,100	4,581	11,000	4,989	12,500	5,670	13,500	6,123
100	7			10,200	4,627	*	*	12,700	5,761	*	*
125	8.5			10,300	4,672	*	*	13,000	5,897	*	*
50	3.5	40	3	5,700	2,585	7,600	3,447	6,600	2,994	9,800	4,445
60	4			6,600	2,994	8,800	3,992	8,400	3,810	10,500	4,763
75	5			7,600	3,447	10,100	4,581	9,800	4,445	12,700	5,761
100	7			8,400	3,810	*	*	10,100	4,581	*	*
125	8.5			9,400	4,264	*	*	10,300	4,672	*	*
70	4.5	60	4	4,500	2,041	7,000	3,175	6,000	2,722	10,200	4,627
75	5			4,700	2,132	7,100	3,221	6,400	2,903	10,400	4,717
100	7			6,400	2,903	*	*	7,100	3,221	*	*
125	8.5			6,600	2,994	*	*	7,400	3,357	*	*

NOTES: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump cap. See figures on page 228.

Although motive pressures are shown at high pressure differentials (difference between motive inlet pressure and total lift or back pressure), it is preferable to use a motive pressure of 10 - 15 psig (0.65 - 1 bar) above discharge (outlet) pressure. This ensures longevity of economical (brass) check valves and reduces both venting time and temperature differential (on steam). If a higher differential is used, stainless steel check valves are recommended.

*Consult factory.

PT-300 Capacity Conversion Factors for Other Fill Heads									
Fill Head		in	mm	in	mm	in	mm	in	mm
		0	0	6	152	12	305	24	610
Model	PT-308	0.7		0.85		1.0		1.2	
	PT-312	0.7		0.85		1.0		1.08	

NOTES: Fill head is measured from drain point to top of cap. See figures on page 228.

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
 - NPT Bronze ASTM B 62
 - Teflon® Disc
 - Class 150 (Minimum)
- Outlet
 - Stainless Steel Check Valve
 - Class 150 (Minimum)
- In-line Check Valves
 - Stainless Steel Non-Slam Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

Sizing and Selection— PT-100/200/300/3500/400/DD-4/DD-6 Series

The Armstrong non-electric pump trap is sized based on actual condensate load (lb/hr or kg/hr) being pumped. The following steps are used to size the pump.

1. Determine the total condensate load to be pumped in lb/hr or kg/hr. See table on page 211 for conversion factors.
2. Determine the total back pressure the pump will operate against. Total back pressure is the sum of the following:
 - Vertical lift expressed in psig. See conversion formula below to convert lift to psig
 - Existing pressure in condensate return line or D.A. tank
 - Frictional loss from pipe, valves and fittings
3. Determine type of motive gas to be used (steam, air or other inert gas) and pressure available.

Example:

- Condensate load = 7,100 lb/hr (3,221 kg/hr).
- Total back pressure = 25 psig (1.5 bar)
(25 foot vertical lift = 10.8 psig, 14 psig in condensate return line).
- Motive pressure is steam at 50 psig (3.5 bar).

Solution: Model PT-3508

Find 25 psig total lift or back pressure in column two of Low Profile Pump Trap Capacities table on page 211. Then find 50 psig motive pressure in column one. Move across the capacity table until you reach a model number with the correct capacity. A PT-3508 has been highlighted on page 211 for this example.

Either a closed reservoir pipe or a vented receiver is required for proper condensate storage during the pump-down cycle of the pumping trap.

For vented/open system receiver sizing:

- Determine the pressure from where the condensate is being discharged.
- Determine condensate load.

Reference Percentage of Flash Steam chart on page 215 to find the pressure that corresponds with the discharge condensate pressure. For this example, use 15 psig.

Follow 15 psig on the horizontal axis where it intersects the curve. Move left from the intersecting lines to the vertical axis for the percentage of flash steam that is created. For this example it will be 3% (see shaded area on Percentage of Flash Steam chart).

Multiply 3% by the condensate load. Using example above 7,100 lb/hr. $7,100 \times .03 = 213$ lb/hr flash steam.

Using the Vented Receiver Sizing table on page 215, find the amount of flash steam in column one. Follow the table across to determine the size of the vented receiver. (See shaded area on Inlet Reservoir Pipe Sizing table—page 215 for this example.)

For closed reservoir piping:

1. Determine condensate load (using example above 7,100 lb/hr).

Reference the inlet reservoir pipe sizing for closed systems on page 215. Find 7,100 lb/hr in column one. Move horizontally across to find proper pipe size. (Note length or diameter may be slightly enlarged when capacity falls between given condensate loads in column one.) Selection is shaded.

Metric Conversion Formulas

Convert lb/hr to kg/hr—By dividing by 2.2046 Example: $1,800 \text{ lb/hr} \div 2.2046 = 816 \text{ kg/hr}$

Convert psig to bar—By dividing by 14.5 Example: $15 \text{ psi} \div 14.5 = 1.03 \text{ bar}$

Convert psig to kg/cm²—By dividing by 14.22 Example: $15 \text{ psi} \div 14.22 = 1.05 \text{ kg/cm}^2$

Reservoir Sizing— PT-100/200/300/3500/400/DD-4/DD-6 Series

Inlet Reservoir Pipe Sizing for Closed Systems

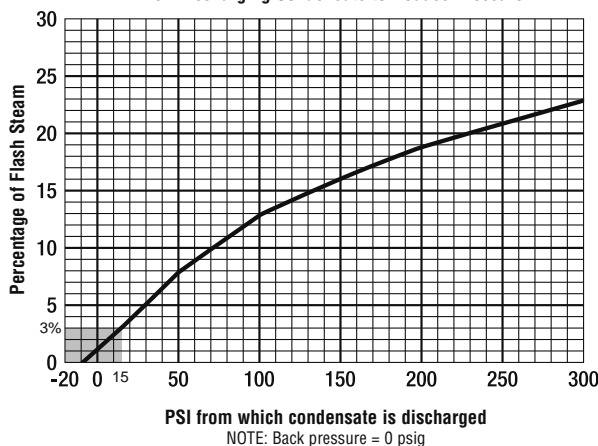
Condensate Load		Reservoir Pipe Diameter											
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
lb/hr	kg/hr	2	50	3	75	4	100	6	150	8	200	10	250
up to		Length of Pipe											
		ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
500	227	4	1.2	2-1/2	0.7	1-1/2	0.4						
1,000	453	4-1/2	1.4	2	0.6	1-1/2	0.4						
1,500	680	7	2.1	3	0.9	2	0.6						
2,000	907	9	2.7	4	1.2	2-1/2	0.7						
2,500	1,134	11	3.4	5	1.5	3	0.9	1-3/4	0.5				
3,000	1,360	13-1/2	4.1	6	1.8	3-1/2	1.1	2	0.6				
4,000	1,814	18	5.5	8-1/2	2.6	5	1.5	2-1/2	0.7				
5,000	2,268			10	3.0	6	1.8	3	0.9	1-1/2	0.4		
6,000	2,722			12	3.7	7	2.1	3-1/2	1.1	2	0.6		
7,000	3,175			14-1/2	4.4	8-1/2	2.6	4	1.2	2	0.6		
8,000	3,629			16-1/2	5.0	9-1/2	2.9	4-1/2	1.4	2-1/2	0.7	1-1/2	0.4
9,000	4,082					11	3.4	5	1.5	3	0.9	2	0.6
10,000	4,536					12	3.7	5-1/2	1.7	3	0.9	2	0.6
11,000	4,990					13	4.0	6	1.8	3-1/2	1.1	2	0.6
12,000	5,443					14	4.3	6-1/2	2.0	4	1.2	2-1/2	0.7

NOTE: When draining condensate from a single piece of equipment in a **closed system**, to achieve maximum energy efficiency a reservoir should be installed horizontally above and ahead of the pump trap. Sufficient reservoir volume is required above the filling head level to hold condensate during the pump trap discharge cycle. The chart above shows the minimum reservoir sizing, based on the condensate load, to prevent equipment flooding during the pump trap discharge cycle.

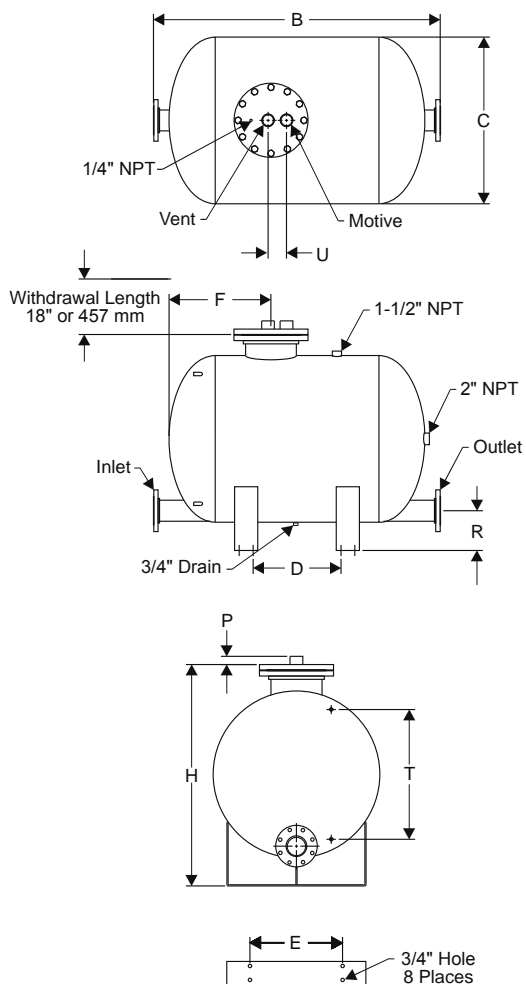
Vented Receiver Sizing for Open Systems

Flash Steam		Receiver Diameter		Receiver Length		Vent Line Diameter	
lb/hr	kg/hr	in	mm	in	mm	in	mm
up to							
75	34	4	102			1-1/2	40
150	68	6	152			2	50
300	136	9	229			2-1/2	65
600	272	10	254	36	914	3	75
900	408	12	300			4	100
1,200	544	16	405			6	150
2,000	907	20	508			8	200

NOTE: When draining from single or multiple pieces of equipment in an **open system**, a vented receiver should be installed horizontally above and ahead of the pump trap. In addition to sufficient holding volume of the condensate above the fill head of the pump trap to hold the condensate during the pump trap cycle, the receiver **must** also be sized to allow enough area for flash steam and condensate separation. An overflow could also be added when required. The minimum recommended water seal is 12" (300 mm). This table shows proper receiver tank sizing based on flash steam present. See the chart at right to calculate the percentage of flash steam at a given pressure drop.

**Percentage of Flash Steam Formed
When Discharging Condensate to Reduce Pressure**


PT-516 High Capacity Pump Trap



Effective recovery and return of hot condensate are essential to overall plant efficiency while conserving energy. Large amounts of condensate provide the best opportunities to save energy.

The Armstrong PT-516 High Capacity Pump Trap is the low maintenance, non-electric solution to moving large amounts of condensate and other liquids from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. Condensate can be returned at temperatures well above the 200°F (93°C) limit of conventional electric pumps without the headaches of leaking seals or cavitation.

Features

- Economical non-electric operation. Uses inexpensive steam air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe—explosion-proof.
- Durable construction. ASME code-stamped carbon steel body vessel.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.

For a fully detailed certified drawing, refer to CDF #1017.

PT-516 High Capacity Pump Trap Physical Data		
	in	mm
Inlet Connection	4 150# ANSI Fig.	100 150# ANSI Fig.
Outlet Connection	4 150# ANSI Fig.	100 150# ANSI Fig.
Motive Connection	2 NPT	50 NPT
Vent Connection	2 NPT	50 NPT
Gauge Glass Conn.	1/2 NPT	15 NPT
"B"	62	1,574
"C"	36	914
"D"	19-1/16	484
"E"	20	508
"F"	22	559
"H"	48	1,219
"P"	1-3/4	44
"R"	8-3/4	222
"T"	28	711
"U"	4	100
Weight	807	366
Number of Bolts	12	12

Maximum Operating Pressure on standard unit: 150 psig (10 bar).

For higher pressure, consult factory.

Maximum Allowable Pressure (standard vessel design): 150 psig @ 500°F (10 bar @ 277°C). 300 psi (21 bar) vessel available upon request.

PT-516 Capacity Conversion Factors for Other Fill Heads

Fill Head	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
	0	0	6	152	12	305	16	406	24	610	36	914
PT-516	0.7		0.75		0.8		0.85		1.0		1.08	

PT-516 High Capacity Pump Trap

Typical Applications

- Low pressure heating systems
- Process heat exchanger or coils with modulating steam control
- Remote installations (tracing, tank farms or remote coils)
- Systems under vacuum
- Hazardous (explosion proof) areas
- Caustic environments
- Sumps or submersed areas

PT-516 High-Capacity Pump Trap Materials	
Name of Part	Description
Cap, Body, Bolting	Fabricated steel 150 psi ASME Sec. VIII design "U" stamp coded
Cap Gasket	Stainless steel spiral wound
Inlet Valve Assembly	Stainless steel
Vent Valve Assembly	Stainless steel
Mechanism Assembly: Frame, Float and Spring	Stainless steel

NOTES: 300 psi ASME vessel available upon request. PT-516 available in all stainless steel. Consult factory.

Armstrong PT-516 Pump Trap Sizing and Selection

PT-516 Pump Trap Capacities									
Motive Pressure		Total Lift or Back Pressure		4" x 4" Connections 24" Fill Head					
				Steam Motive		Air Motive			
psig	bar	psig	bar	lb/hr	kg/hr	lb/hr	kg/hr		
15	1.0	5 0.	34	28,962	13,137	57,619	26,136		
25	1.7			37,162	16,857	61,911	28,083		
35	2.5			42,563	19,307	64,738	29,365		
50	3.5			48,288	21,903	67,735	30,725		
60	4			51,214	23,231	69,267	31,420		
70	4.5			53,688	24,138	70,562	32,007		
75	5			54,796	24,855	71,142	32,270		
100	7			59,414	26,950	73,559	33,366		
125	8.5	15	1	62,995	28,575	*	*		
150	10.34			65,922	29,902	*	*		
25	1.7			36,720	16,656	50,783	23,035		
35	2.5			40,611	18,421	54,293	24,627		
50	3.5			45,196	20,501	58,013	26,315		
60	4			47,740	21,655	59,915	27,177		
70	4.5			50,005	22,682	61,523	27,907		
75	5			51,054	23,159	62,243	28,233		
100	7			55,675	25,254	65,243	29,594		
125	8.5			59,552	27,013	*	*		
150	10.34			62,923	28,542	*	*		
NOTES: Published capacities above are based on actual steam testing using a minimum 200°F condensate. Published capacities are based on the use of external check valves supplied by Armstrong.									
*Consult factory									

Motive Pressure		Total Lift or Back Pressure		4" x 4" Connections 24" Fill Head					
				Steam Motive		Air Motive			
psig	bar	psig	bar	lb/hr	kg/hr	lb/hr	kg/hr		
35	2.5	25	1.7	29,212	13,251	46,238	20,973		
50	3.5			33,413	15,156	50,962	23,116		
60	4			35,672	16,181	53,376	24,211		
70	4.5			37,646	17,076	55,418	25,138		
75	5			38,548	17,485	56,313	25,544		
100	7			42,454	19,257	60,141	27,280		
125	8.5			45,649	20,706	*	*		
150	10.34			*	*	*	*		
50	3.5	40	3	26,210	11,889	41,244	18,708		
60	4			27,353	12,407	44,028	19,971		
70	4.5			28,319	12,846	46,382	21,039		
75	5			28,752	13,042	47,435	21,517		
100	7			30,555	13,860	51,828	24,022		
125	8.5			31,954	14,494	*	*		
150	10.34			33,097	15,013	*	*		
70	4.5	60	4	25,973	11,781	32,026	14,527		
75	5			26,373	11,963	33,514	15,202		
100	7			28,042	12,720	40,951	18,575		
125	8.5			29,336	13,307	*	*		
150	10.34			30,394	13,787	*	*		
100	7	80	5.5	23,892	10,837	34,893	15,827		
125	8.5			24,231	10,991	*	*		
150	10.34			24,570	11,145	*	*		

NOTES: Published capacities above are based on actual steam testing using a minimum 200°F condensate. Published capacities are based on the use of external check valves supplied by Armstrong.

*Consult factory.

Options

External check valves required for use of pumping trap.

- Inlet/Outlet Check Valve
CS/SS Wafer Style or All Stainless Steel Wafer Style
- Bronze Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter

Reservoir Sizing — DD-12/PT-516 Series High Capacity

Either a closed reservoir pipe or a vented receiver is required for proper condensate storage during the pump-down cycle of the pumping trap. Refer to the tables for sizing.

For Closed Reservoir Piping

1. Determine condensate load.

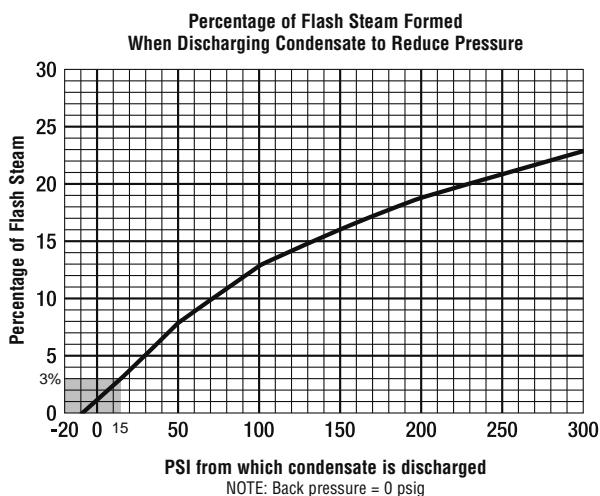
Example 30,000 lb/hr:

- Reference the Inlet Reservoir Pipe table top right. Find the 30,000 lb/hr condensate load in column one. Move across the columns to find the proper pipe sizing.

For Vented Receiver Sizing

1. Determine the pressure from where the condensate is being discharged.
2. Determine condensate load.
 - Reference the chart below to find the pressure that corresponds with the discharge condensate pressure. For this example, use 15 psig.
 - Follow 15 psig to where it intersects the "0" psig curve. Move to the left from intersecting lines for the percentage of flash that will be created. For this example, it will be 3%.
 - Multiply the 3% by the condensate load. For this example, it is 30,000 lb/hr. Thus, $30,000 \times .03 = 900$ lb/hr of flash steam.

Using the Vented Receiver table bottom right, find the amount of flash steam in column one. Follow the table across to determine the sizing of the vented receiver.



PT-516 Inlet Reservoir Pipe Sizing for Closed Systems

Condensate Load lb/hr	Reservoir Pipe Diameter (in)					
	8	10	12	16	20	24
up to	Length of Pipe (feet)					
10,000	6-1/2	6	5	3	2	
20,000	12	11-1/2	10	7	4	
30,000		12	10-1/2	9	6	4
40,000		17	14	12	8	6
50,000			16	13	9	6
60,000				15	11	8
70,000					15	10

NOTE: When BP/MP is less than 50%, the reservoir diameters above can be reduced by 1/2" (15 mm). When draining condensate from a single piece of equipment in a **closed system**, to achieve maximum energy efficiency (see Closed System figure on page 228) a reservoir should be installed horizontally above and ahead of the pump trap. Sufficient reservoir volume is required above the filling head level to hold condensate during the pump trap discharge cycle. The table above shows the minimum reservoir sizing, based on the condensate load, to prevent equipment flooding during the pump trap discharge cycle.

PT-516 Vented Receiver for an Open System

Flash Steam lb/hr	Receiver Diameter (in)	Receiver Length (in)	Vent Line Diameter (in)
up to			
1,000	16	60	6
2,000	20	60	8
3,000	24	60	8
4,000	26	60	10
5,000	28	60	10
6,000	30	72	12
7,000	32	72	12
8,000	36	72	14

NOTE: When draining from single or multiple pieces of equipment in an **open system**, a vented receiver should be installed horizontally above and ahead of the pump trap (see Open System figure on page 228). In addition to sufficient holding volume of the condensate above the fill head of the pump trap to hold the condensate during the pump trap cycle, the receiver must also be sized to allow enough area for flash steam and condensate separation. An overflow could also be added when required. The minimum recommended water seal is 12" (305 mm). The table above shows proper receiver tank sizing based on flash steam present. See chart left to calculate the percentage (%) of flash steam at a given pressure drop.

PT-300LL/PT-400LL Light Liquid Pump Traps

Features

- Economical non-electric operation. Uses inexpensive steam or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard unit is intrinsically safe.
- Durable construction. ASME code-stamped carbon steel body vessel.
- Corrosion resistance. Internals are all stainless steel for corrosion resistance and long life.
- Heavy-duty springs. Springs are made from long-lasting Inconel X-750.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The pump can be used in flooded pits without fear of electrocution or circuit breaker defaults.
- Externally removable/replaceable seats. Seats can be replaced or cleaned without removing the mechanism assembly.
- Specific gravity range. Pumps can accommodate specific gravity down to 0.65.

Typical Applications

- Hydrocarbon knockout drum/separator
- Flare header drain
- Applications where the specific gravity of the liquid could be as low as 0.65
- Applications where hydrocarbons may be present

Technical Data

Back Pressure

- Maximum back pressure for the PT-300LL or PT-400LL is 60 psig (4.1 bar)

Motive Pressure

- Maximum motive pressure (Nitrogen or Inert Gas) is 100 psig (6.9 bar)

NOTE: To determine the lb/hr of liquid being pumped, use the following formula:

$$\text{lb/hr of liquid} = \text{capacities} \times \text{specific gravity of liquid}$$

To size the Light Liquid Pumps, use the sizing charts on pages 209 and 213.

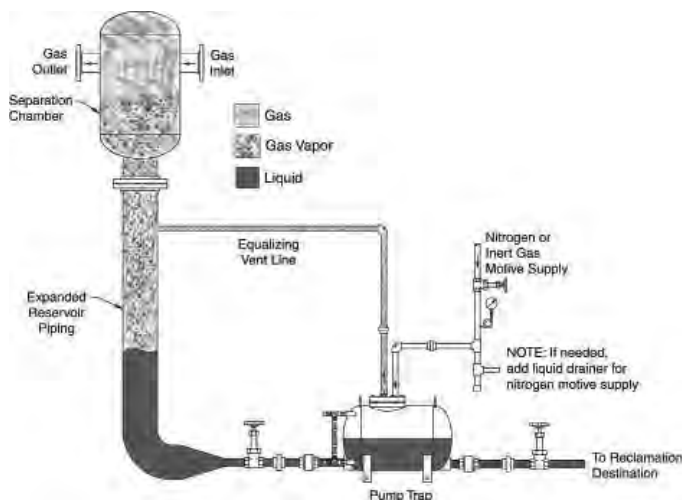
Consult Armstrong for engineered pre-piped receiver packages.



PT-300LL Light Liquid Pump Trap



PT-400LL Light Liquid Pump Trap



Hydrocarbon Knockout Drum Separator

Double Duty® 4 Steam Trap/Pump Combination

Description

Armstrong's Double Duty® Series steam trap/pump combination offers a low profile solution to draining heat exchangers in various applications.

The Double Duty® 4 is a low profile pump that offers you the versatility of combining a pump within a steam trap to aide in condensate drainage from a heat exchanger under all operating conditions.

Features

- Economical. non-electric operation
- Low-maintenance operation. No leaking seals, impeller or motor problems. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade installation.
- Peace of mind. Intrinsically safe.
- Ductile iron durability. Rugged construction material means long service life.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The trap/pump can be used in pits or sumps without fear of electrocution or circuit breaker defaults.

Maximum Operating Conditions

Maximum allowable pressure
DD-4 72 psig @ 320°F (5 bar @ 160°C)

Maximum operating pressure:
DD-4 72 psig @ 320°F (5 bar @ 160°C)

Materials

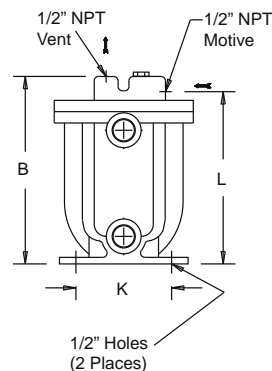
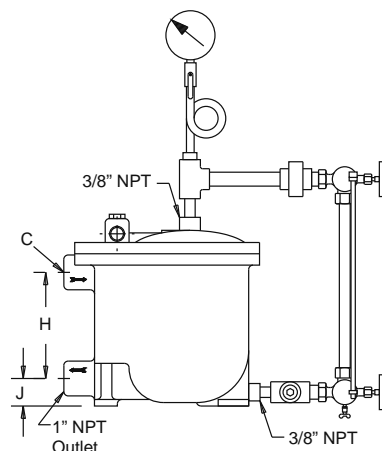
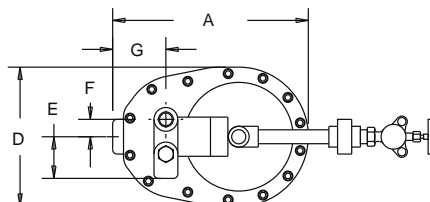
Body: Ductile iron
Mechanism: All stainless steel
Springs: 304 Stainless steel
Float: All stainless steel

For a fully detailed certified drawing, refer to CD-2030.

Double Duty® 4 Physical Data		
	in	mm
"A"	11-3/16	284
"B"	10-13/16	274
"C"	1	25
"D"	8	203
"E"	2-7/16	61
"F"	1	25
"G"	3	76
"H"	6-1/8	155
"J"	1-5/8	41
"K"	5-1/2	140
"L"	9-15/16	251
Weight lb (kg)	37 (17)	



Double Duty® 4



Double Duty® 4 Steam Trap/Pump Combination

Double Duty® 4 Pump Capacities					
Motive		Back Pressure		Capacity	
psi	bar	psi	bar	lb/hr	kg/hr
15	1	5	0.34	220	100
25	1.7			300	136
50	3.5			348	158
70	4.5			350	159
25	1.7	15	1	220	100
50	3.5			345	156
70	4.5			348	158
35	2.5	25	1.7	220	100
50	3.5			325	147
70	4.5			348	158
50	3.5	40	3	220	100
60	4			300	136
70	4.5			335	152
70	4.5	60	4	220	100

NOTE: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump case.

Capacity Conversion Factors for Other Filling Heads			
Filling Head			
in	0	2	6
mm	0	50	152
Double Duty DD-4	.65	1.0	1.10

NOTE: Fill head measured from drain to top of cap.

Double Duty® 4 Trap Capacities			
Differential Pressure		Capacity	
psi	bar	lb/hr	kg/hr
5	0.34	1,342	610
10	0.7	1,980	900
20	1.4	2,860	1300
30	2.1	3,410	1550
40	3	3,795	1725
50	3.4	4,070	1850
60	4.1	4,235	1925
70	4.8	4,400	2000

Double Duty® 6 Steam Trap/Pump Combination

Description

Armstrong's Double Duty® Series steam trap/pump combination offers a low profile solution to draining heat exchangers in various applications.

The Double Duty® 6 is an ASME code stamped carbon steel vessel. The Double Duty® 6 offers you the versatility of combining a pump within a steam trap to aide in condensate drainage under all operating conditions.

Features

- Economical. non-electric operation
- Low-maintenance operation. No leaking seals, impeller or motor problems. No NPSH issues.
- Space-saving size. Low-profile body fits in tight spaces while allowing minimal fill head.
- Lower installation costs. Single trade installation.
- Peace of mind. Intrinsically safe.
- ASME Carbon Steel durability. Rugged construction material means long service life.
- Efficiency. A closed loop means no motive or flash steam is lost. All valuable Btu's are captured and returned to the system.
- Safety. The trap/pump can be used in pits or sumps without fear of electrocution or circuit breaker defaults.

Maximum Operating Conditions

Maximum allowable pressure

DD-6 200 psig @ 400°F (14 bar @ 204°C)

Maximum operating pressure:

DD-6 200 psig @ 400°F (14 bar @ 204°C)

Materials

Body: ASME Code Stamped Carbon Steel
Springs: Inconel X-750
Internals: All stainless steel

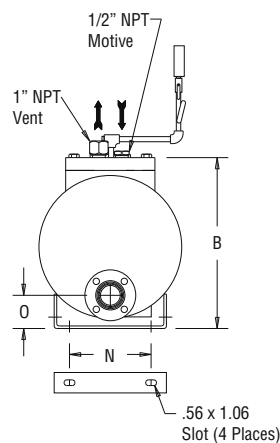
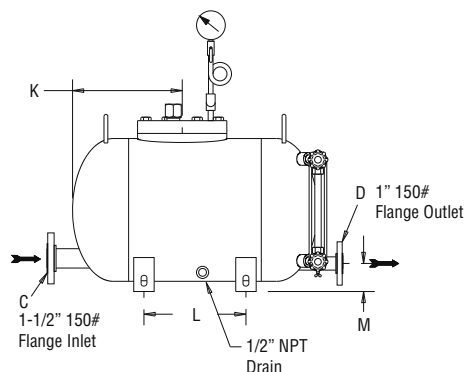
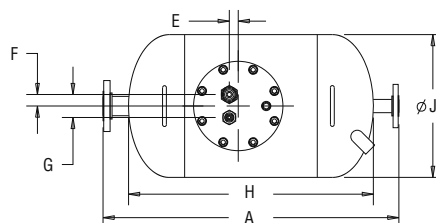
For a fully detailed certified drawing, refer to CD2035.

Double Duty® 6 Physical Data

	in	mm
"A"	29	737
"B"	16-11/16	424
"C"	1-1/2	38
"D"	1	25
"E"	7/8	22
"F"	1-1/8	28
"G"	2-1/4	57
"H"	24	610
"J"	14	356
"K"	10-13/16	275
"L"	10	254
"M"	2-13/16	71
"N"	8	203
"O"	3-3/16	81
Weight lb (kg)	140 (64)	



Double Duty® 6



Double Duty® 6 Steam Trap/Pump Combination

Double Duty® 6 Pump Capacities					
Motive		Back Pressure		Capacity	
psi	bar	psi	bar	lb/hr	kg/hr
15	1	5	0.34	2,400	1,089
25	1.7			3,000	1,361
50	3.5			4,000	1,814
75	5			4,500	2,041
100	7			4,600	2,087
125	8.5			4,700	2,132
150	10.34			4,800	2,177
175	12			4,800	2,177
200	14			4,600	2,087
25	1.7	15	1	2,000	907
50	3.5			2,800	1,270
75	5			3,400	1,542
100	7			3,600	1,633
125	8.5			3,700	1,678
150	10.34			3,800	1,724
175	12			3,600	1,633
200	14			3,500	1,588
35	2.5	25	1.7	1,800	816
50	3.5			2,300	1,043
75	5			2,900	1,315
100	7			3,000	1,361
125	8.5			3,000	1,361
150	10.34			2,900	1,315
175	12			2,500	1,134
200	14			2,300	1,043
50	3.5	40	3	1,400	635
75	5			2,000	907
100	7			2,400	1,089
125	8.5			2,500	1,134
150	10.34			2,500	1,134
175	12			1,800	816
200	14			1,700	771
75	5	60	4	1,500	680
100	7			1,800	816
125	8.5			2,000	907
150	10.34			1,700	771
175	12			1,500	680
200	14			1,400	635

NOTE: Published capacities are based on the use of external check valves supplied by Armstrong. Fill head measured from drain point to top of pump case.

Double Duty® 6 Trap Capacities			
Differential Pressure		Capacity	
psi	bar	lb/hr	kg/hr
2	0.14	9,500	4,309
5	0.34	12,400	5,625
10	0.7	15,000	6,804
25	1.7	20,400	9,253
50	3.5	22,500	10,206
75	5.2	22,500	10,206
100	6.9	22,500	10,206
150	10.3	22,500	10,206
200	13.8	22,500	10,206

Capacity Conversion Factors for Other Filling Heads				
Filling Head				
in	0	6	12	* 24 or greater
mm	0	150	305	* 620 or greater
Double Duty DD-6	0.7	1.0	1.08	* Consult factory

NOTE: Fill head measured from drain to top of cap.

Double Duty® 12

Steam Trap/Pump Combination

Description

Armstrong's Double Duty-12 steam trap/pump combination offers a unique solution for draining condensate from heat exchangers and coils in various applications.

The Double Duty-12 is an ASME code stamped carbon steel vessel which offers you the versatility of combining a pump mechanism within a steam trap to assist in condensate drainage under all operating conditions.

Features

- ASME Section VIII "U" stamped vessel
- Inconel X-750 springs for long service life
- All stainless steel internals
- Easy access to the steam trap mechanism without removing cap assembly
- Externally removable vent and motive seats
- Separate pump and trap mechanisms

Maximum Operating Conditions

Maximum allowable pressure: 200 psig @ 400°F (14 bar @ 204°C)

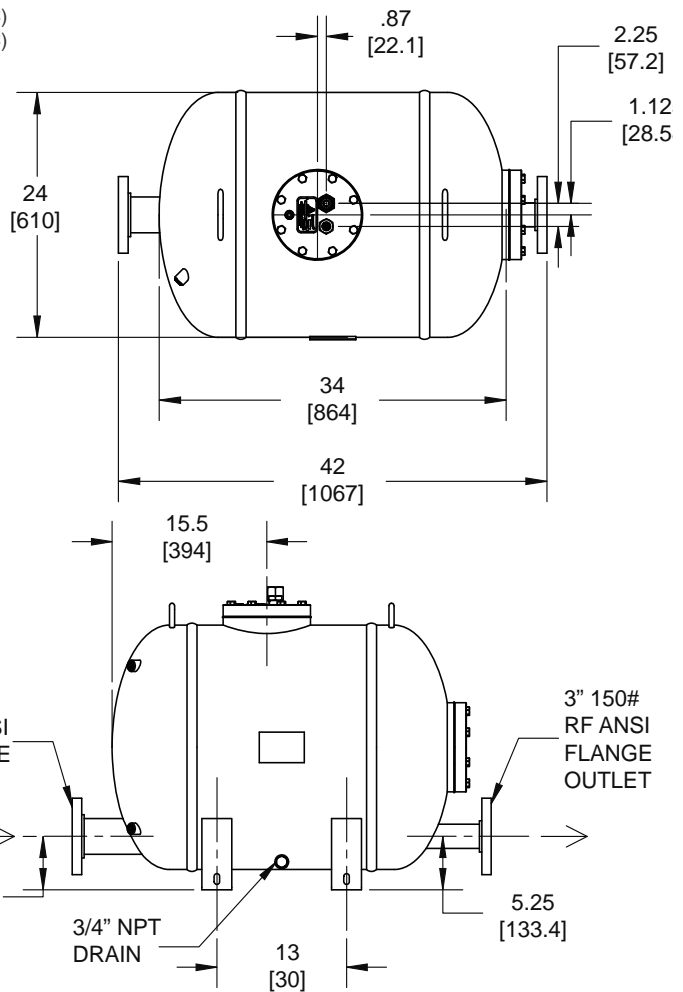
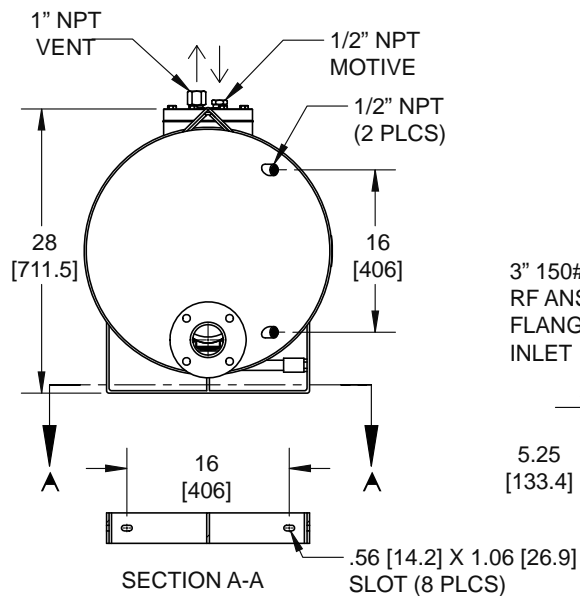
Maximum operating pressure: 200 psig @ 400°F (14 bar @ 204°C)

(Consult factory for different pressure/temperature ratings)

Materials

Body: ASME code carbon steel
Springs: Inconel X-750
Internals: Stainless steel

For a fully detailed certified drawing, refer to CD-2472.



Double Duty® 12

Steam Trap/Pump Combination

Double Duty® 12 Pump Capacities

Motive		Back Pressure		Capacity	
psi	bar	psi	bar	lb/hr	kg/hr
15	1	5	0.34	9,800	4,445
25	1.7			12,900	5,581
50	3.5			16,500	7,484
75	5			18,200	8,255
100	7			18,900	8,573
125	8.5			19,300	8,754
150	10.34			19,800	8,981
175	12			19,900	9,026
200	14			19,900	9,026
25	1.7	15	1	8,500	3,856
50	3.5			12,900	5,851
75	5			14,800	6,713
100	7			16,000	7,257
125	8.5			16,400	7,439
150	10.34			17,200	7,802
175	12			17,300	7,847
200	14			17,300	7,847
35	2.5	25	1.7	7,200	3,266
50	3.5			10,300	4,672
75	5			12,300	5,579
100	7			13,700	6,214
125	8.5			13,700	6,214
150	10.34			14,700	6,668
175	12			14,800	6,713
200	14			15,000	6,804
50	3.5	40	3	6,700	3,039
75	5			9,500	4,309
100	7			10,600	4,808
125	8.5			10,900	4,944
150	10.34			11,300	5,126
175	12			11,300	5,126
200	14			11,400	5,171
75	5	60	4	6,900	3,130
100	7			8,300	3,765
125	8.5			8,300	3,765
150	10.34			8,400	3,810
175	12			8,400	3,810
200	14			8,600	3,901
100	7	80	5.5	6,400	2,903
125	8.5			6,400	2,903
150	10.34			7,200	3,266
175	12			7,200	3,266
200	14			7,300	3,311

NOTE: Published capacities are based on the use of external check valves supplied by Armstrong.

Capacity Conversion Factors for Other Filling Heads

Filling Head					
in	0	6	12	24	* 24 or greater
mm	0	150	305	610	* 620 or greater
Double Duty DD-12	.7	.85	1	1.08	* Consult Factory

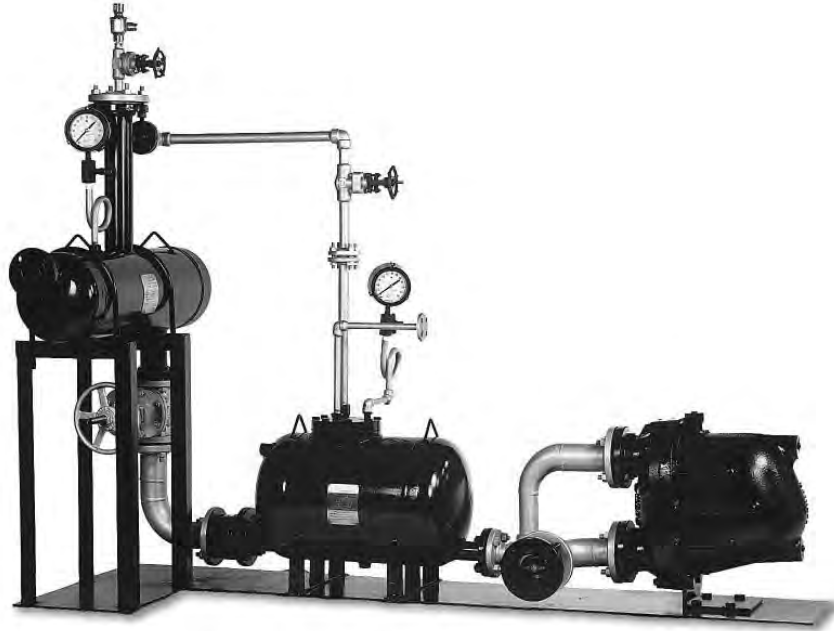
Double Duty® 12 Trap Capacities

Differential Pressure		Capacity	
psi	bar	lb/hr	kg/hr
2	.14	21,500	9,752
5	.34	28,700	13,018
10	.7	35,900	16,284
25	1.7	52,100	23,632
50	3.5	59,600	27,034
75	5.2	72,000	32,659
100	6.9	81,000	36,741
150	10.3	93,000	42,184

NOTE: Fill head measured from drain to top of cap.
Weight in lb/kg: 348 (158)

Armstrong Packaged Solutions

Custom Fabrications



Armstrong can design and fabricate custom packages to fit your application needs.

ASME Packages



Armstrong can design and fabricate all ASME packages to meet your plant piping requirements.

Standard



Armstrong's standard simplex (shown), duplex, triplex or quadraplex packages are unparalleled in quality and craftsmanship.

Accessories



Horizontal ASME Reservoirs/Horizontal Flash Tanks

ASME stamped vessels designed for condensate collection or use as horizontal flash tanks. (Horizontal flash tanks with sparge tubes and drop legs are also available - consult factory)



Pre-Piped PRV Station

PRV/Drip trap stations, pre-piped to single pumps or packages.



Exhaust Heads

Eliminate water carryover in atmospheric vent pipe.

Insulation Blankets

- Pumps
- Receivers (consult factory for models)

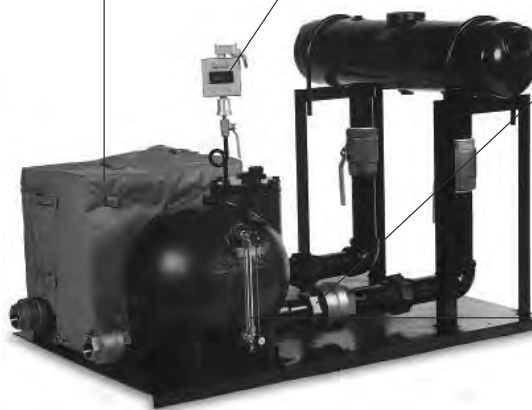
Digital Cycle Counters

- Open- or closed-loop designs
- Optional external dry contacts
- Intrinsically safe models available (consult factory)

Options

Use of external check valves required for operation of pumping trap.

- Inlet Swing Check Valve
NPT Bronze ASTM B 62
Teflon® Disc
Class 150 (Minimum)
- Outlet
Stainless Steel Check Valve
Class 150 (Minimum)
- In-line Check Valves
Stainless Steel Non-Slam
Check Valves
- Bronze Gauge Glass Assembly
- Steel Gauge Glass Assembly
- Removable Insulation Jacket
- Digital Cycle Counter



Check Valves

- Stainless steel in-line non-slam check valves
- Bronze/stainless steel (standard)
- Cast steel/stainless steel wafer-style (flanged pumps)
- Stainless steel/stainless steel wafer-style (flanged pumps)
- Bronze (standard)

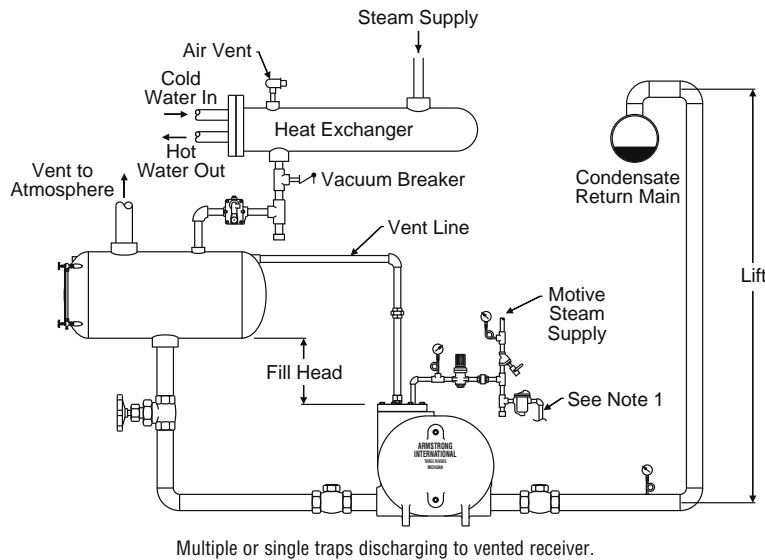
Level Gauges

- Bronze glass gauge (standard)
- Carbon steel glass gauge
- Reflex gauge (HPI Service)—consult factory

Pump/Package Accessories

Low Boy™ packages enable you to utilize mechanical pump technology in limited height applications.

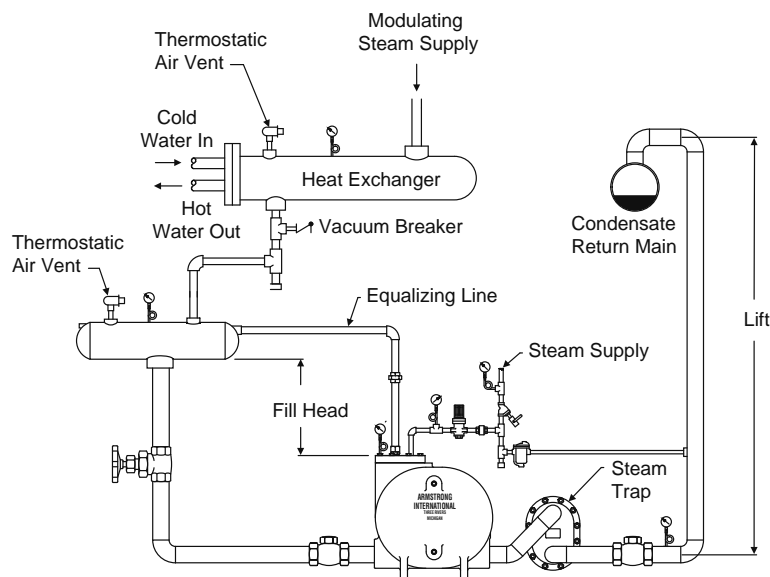
General Applications



OPEN SYSTEMS

For the majority of applications, a steam trap is recommended on each piece of heat exchange equipment. The steam trap, or traps, discharge to a vented receiver where flash steam will be vented to the atmosphere. The pump trap is located downstream and below the vented receiver, allowing for proper fill head height. See tables on page 215 and 218 for vented receiver and vent sizing for an open system.

Note 1: Drip trap may be discharged into the receiver, the return line or to the drain.



CLOSED SYSTEMS

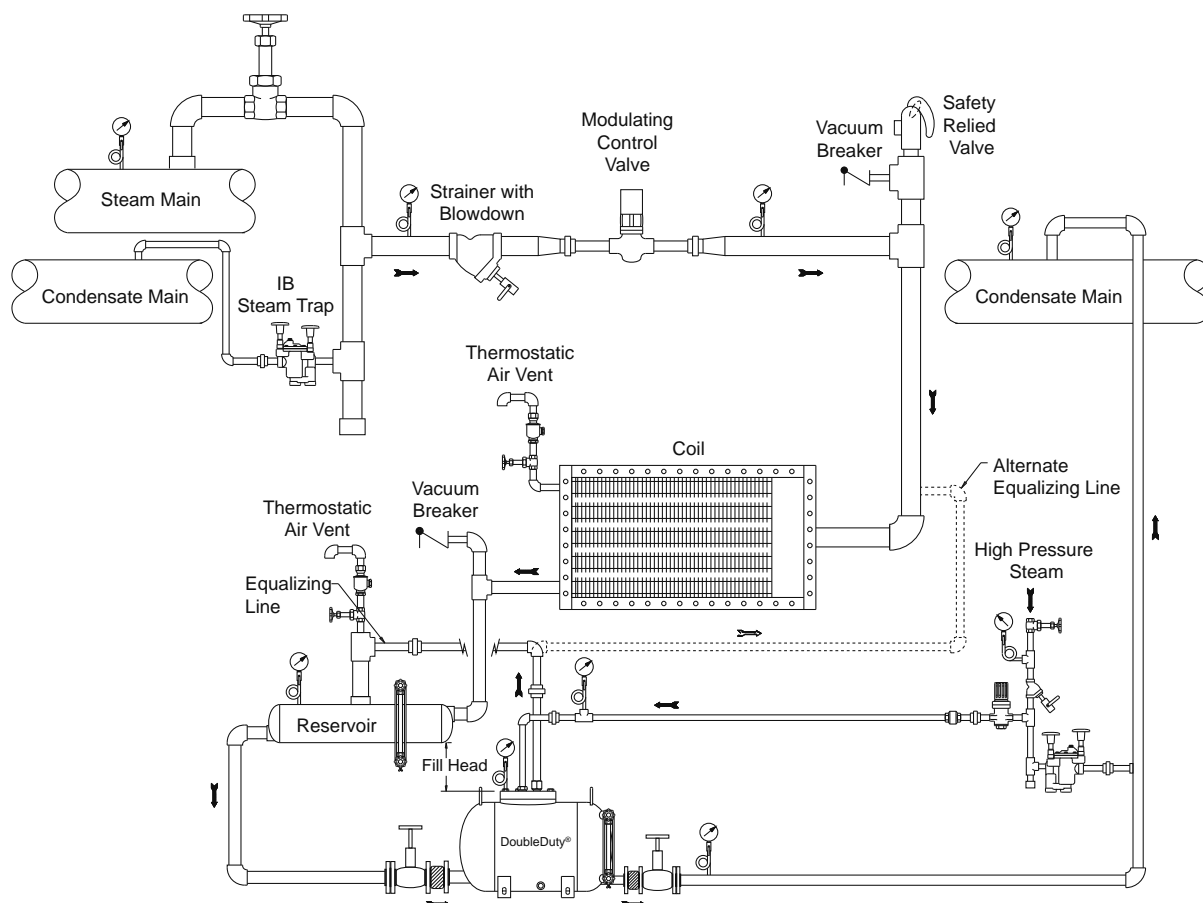
Applications exist where it is desirable to tie the vent line back into the heat exchange space, equalizing the pressure in the heat exchanger, reservoir/piping and the pump trap. This allows water to flow by gravity down to the pump where it can be returned. Valuable Btu's remain within the system due to no flash steam loss to the atmosphere through the vent. Closed system applications can also be used to drain liquid from the equipment under a vacuum. See installation and operation manual IB-100. See tables on pages 215 and 218 for reservoir pipe sizing.

Note 1: If steam motive is used, the drip trap may be discharged into the return line or to the drain.

Note 2: Vent piping from the pump trap can be connected to the inlet side of the equipment being drained if the pressure drop across the equipment is less than .5 psi (0.03 bar) and there is a minimum of 24" (609 mm) of fill head present.

Note 3: A vacuum breaker must be installed if the vent piping from the pump trap is connected to the receiver. If the equipment modulated down to a sub-atmospheric condition, the vacuum breaker will open to equalize the system and provide adequate drainage.

Double Duty® Typical Application

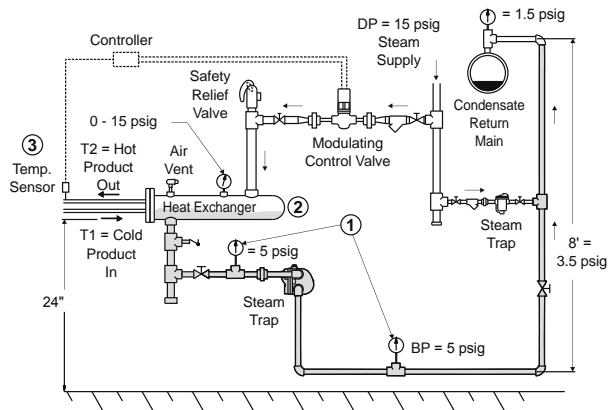


Common Applications for Condensate Armstrong Pump Traps

- Air Heating Coils
- Plate and Frame Heaters
- Jacketed Kettles
- Vacuum Space
- Flash Tanks
- Shell and Tube Heat Exchangers
- Absorption Chillers
- Low Pressure Applications

Any application using modulated control.

Condensate Drainage From Modulated Steam/Temperature Controlled Equipment



Problem: "Stall" Condition on Modulated Steam Control

Modulated steam controls are required to change steam pressure in the heat exchanger to control accurate product output temperature. Due to these varying steam pressure changes, a stall condition exists in all heat exchangers where condensate cannot flow through the steam trap due to insufficient pressure differential. Under the stall condition, partial or complete flooding will occur. Reference figure above noting the stall conditions and problems that can occur.

Problems

1. Stall condition—no condensate drainage due to insufficient pressure to move condensate through the steam trap
2. Heat exchange equipment floods causing equipment damage from:
 - Water hammer due to steam and condensate occupying the same space
 - Corrosion due to carbonic acid forming from sub-cooled condensate reabsorbing trapped carbon dioxide and non-condensable gases
3. Inaccurate temperature control

Stall Chart

Use of the stall chart on right will determine the point where flooding will occur.

Application information required:

DP = design pressure to heat exchanger
BP = back pressure
T1 = incoming temperature
T2 = exit temperature
MT = mean temperature

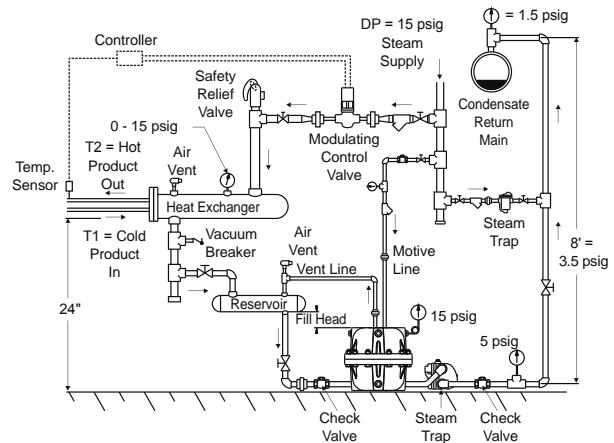
Example

15 psig
5 psig
60°F
140°F
100°F

Stall Information:

SL = stall load %
ST = stall load temperature

85%
72°F



Armstrong Solution

The Armstrong pump trap and steam trap combination is the total solution to the stall condition by removing condensate under all system conditions. When the steam system pressure is sufficient to overcome the back pressure, the steam trap operates normally. When the system pressure falls to the stall condition, the pump trap operates and pumps condensate through the steam trap. Temperature control and condensate drainage are assured under all system conditions.

NOTE: The pump trap is sized for the stall conditions.

NOTE: Closed-loop solution shown. See page 228 for vented system arrangement.

