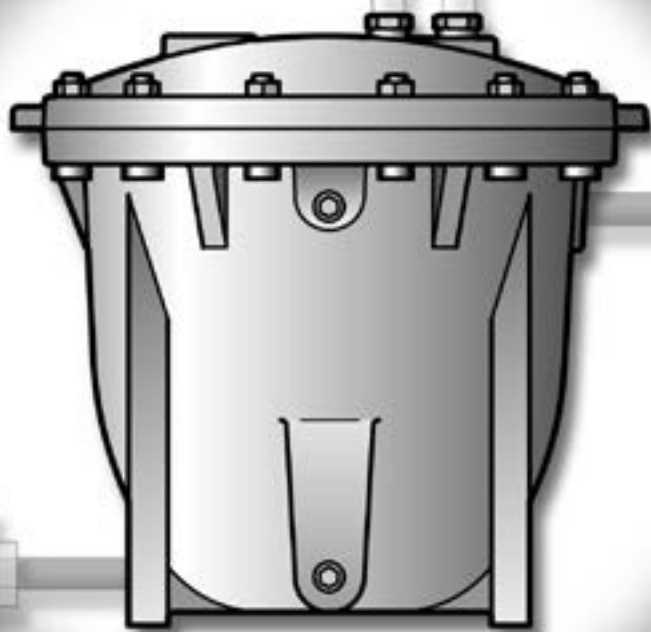


Condensate
Recovery
Equipment



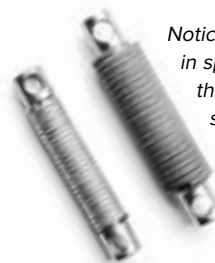
Armstrong



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.

Wear and corrosion resistance

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

Stress chloride corrosion resistance

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

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.

Externally replaceable valve and seat assembly

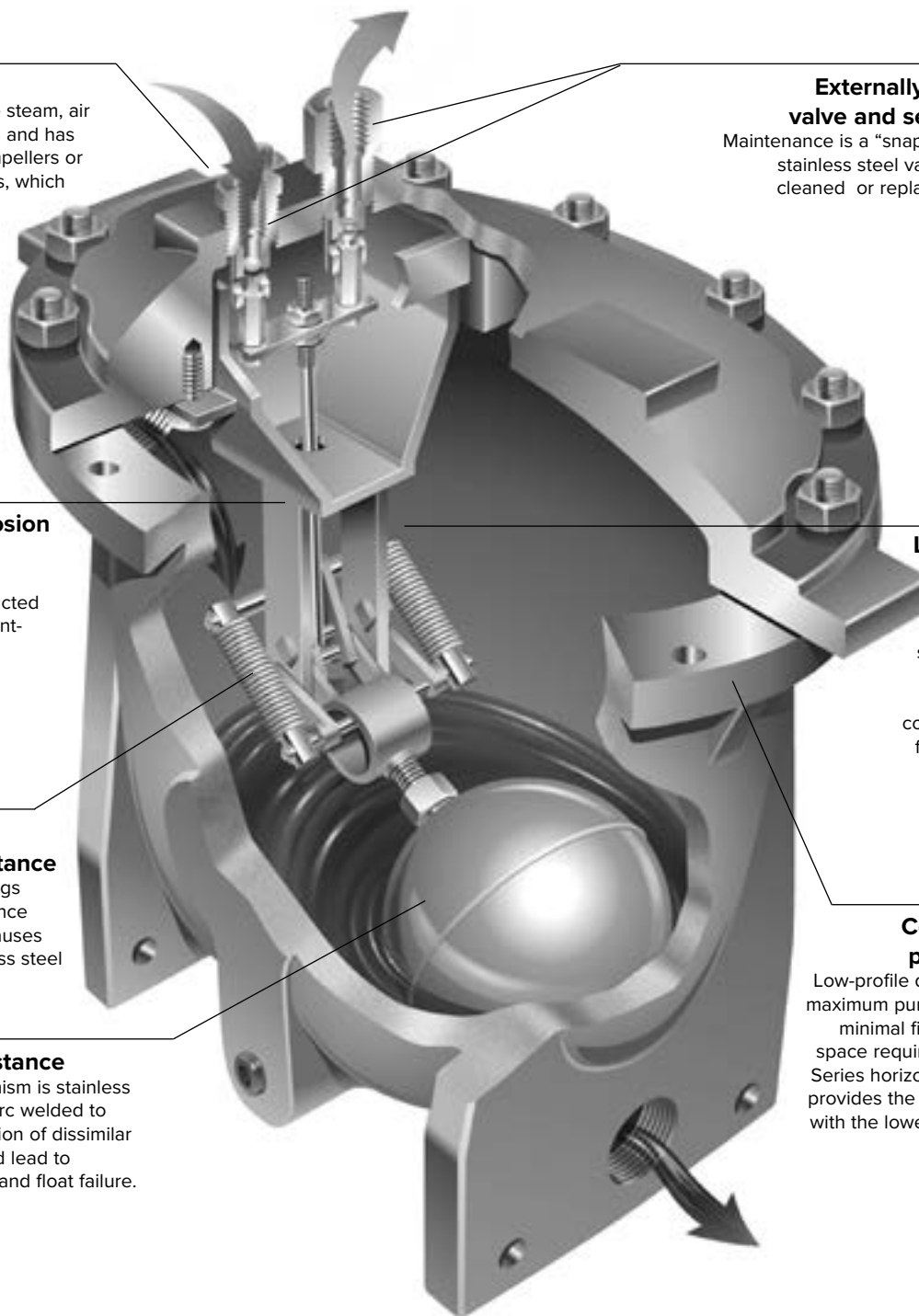
Maintenance is a "snap" with hardened stainless steel valves that can be cleaned or replaced without cap removal.

Long life and dependable service

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

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.



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
Equipment

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**

$(A)8000 \times (B)7200 \times (C).005$

8.34 lb/gal

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

$(A)8000 \times (B)7200 \times (D)140 \times (E)5.00$

*1000 x 1000

H) Cost of Steam to Operate*

Armstrong Pump Trap= **\$ 864.00**

$3 \times (A)8000 \times (B)7200 \times (E)5.00$

1000 x 1000

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

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

** $(\text{cost of equipment/installation}) \$20\ 000$

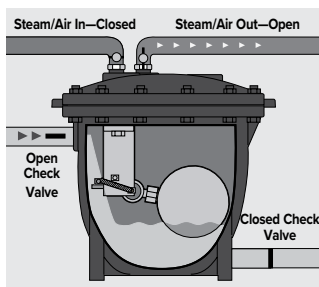
$(I) 73\ 988$

* Btu/lb from direct steam injection

** Estimated equipment and installation cost

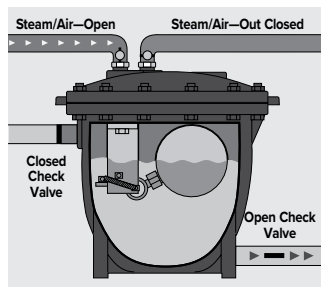
+ Cost to operate in example assumes an "open" vented system. If pump trap is used in "closed loop" application, steam operation cost is negligible.

Pumping Trap Operation



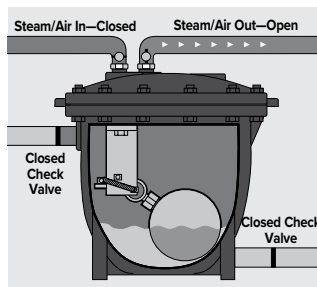
Filling

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.



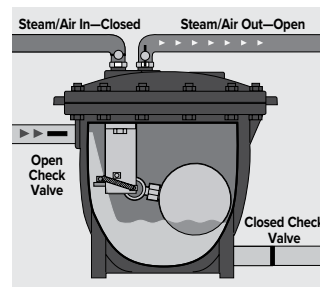
Begin Pumping

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.



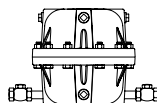
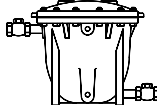
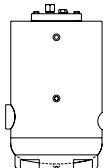
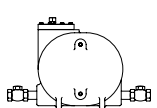
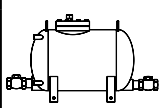
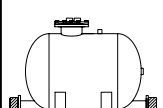
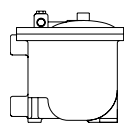
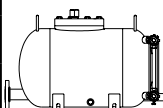
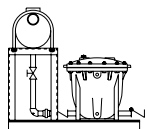
Repeat Filling

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

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.



Armstrong® Pumping Trap ID Charts

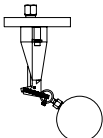
Illustration	Type	Connection Type	Max. Allow. Press. psig	TMA °F	Body Material	Mechanism Material	Model	Max. Oper. Press. psig	Capacity Range lb/hr	Connection Size				Located on Page
										1"	1-1/2"	2"	3" x 2"	
	Series PT-100	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-104	100	1 800	●				239
	Series PT-200	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-204	125	2 400	●				241
							PT-206		3 700		●			
	Series PT-400	**Screwed	150	*650	**Fabricated Steel 150 psig ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-404	125	3 600	●				243
	Series PT-400LL	**150# ANSI Flanged					PT-406		5 500		●			258
							PT-408 PT-412		7 400 12 200			●	●	
	Series PT-3500	Screwed	150	450	ASTM A48 Class 30 Cast Iron	Stainless Steel with Inconel X-750 Spring	PT-3508 PT-3512	125	9 900 14 500			●		245
	Series PT-300	Screwed	150	*650	**Fabricated Steel 150 psig ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-308	125	11 600			●		247
	Series PT-300LL	**150# ANSI Flanged		550			PT-312		16 600				●	258
		**300# ANSI Flanged												
	Series PT-500	**150# ANSI Flanged	150	500	**Fabricated Steel 150 psig ASME Sec. VIII Design "U" Stamped	Stainless Steel with Inconel X-750 Spring	PT-516	150	80 000			4" x 4"		255
	Double Duty® 4	Screwed	72	320	Ductile Iron	Stainless Steel	Simplex Duplex	72	up to 350			1" x 1"		259
	Double Duty® 6	**150# ANSI Flanged	200	400	Carbon Steel	Stainless Steel with Inconel X-750 Spring	Simplex Duplex Triplex Quadplex	200	up to 4 800			1-1/2" x 1"		261
	PT-6F													251
	Double Duty® 12								up to 19 900			3" x 3"		263
	PT-12F													253
	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												

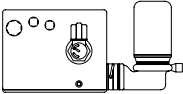
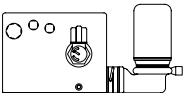
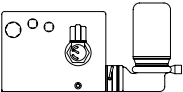
**Other connection type, receiver pressure vessel ratings and material type available upon request—consult factory.

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

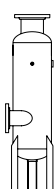
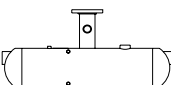
Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

Pumping Trap ID Charts

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	271		

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)	273
	FHC Series				Duplex 1/2 or 3/4				FHC Series 15 - 36 (Cast Iron)	
	AFH-4100 4200 4300 4600 4700 4800	2 000 thru 50 000	*3 thru 75	*20 thru 50	*1/3 thru 5	1 750 and 3 500 Single or Three Phase	3/4" thru 1-1/2"	2" thru 4"	AFH-4100/4300/4600/4700/4800 8 - 120 (Steel/SS)	276 thru 282
	Simplex or Duplex								AFH-4200/4700 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	287 thru 289

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	30 to 150	6 to 30	*20 to 50	1/3 to 3	1 750 and 3 500 Single or Three Phase	3/4 to 1 1/2	2 1/2 thru 4	30 to 120	284 thru 286

Flash Tank ID Chart							
Illustration	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	292
	HAFT Horizontal Flash Tanks	NPT Flanged	4" thru 30"				293 thru 295

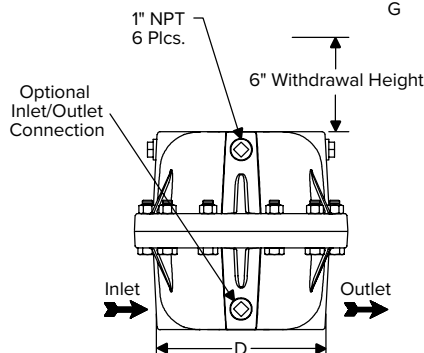
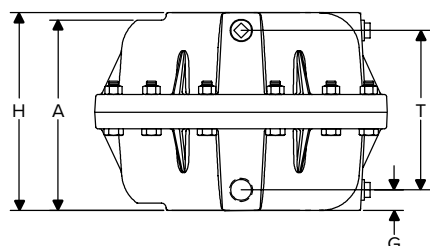
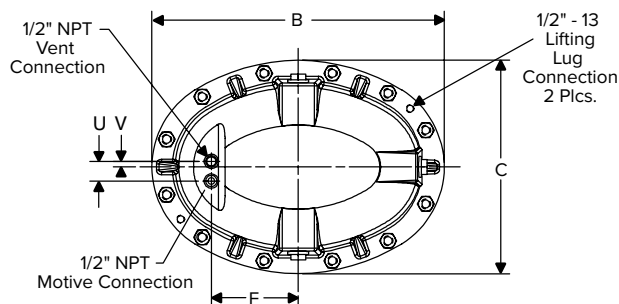
*Other capacities, discharge pressures and HP available - consult factory.

**Other pressure ratings available upon request.

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.



Armstrong® 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 barg)	
Maximum Allowable Pressure (vessel design)	150 psig @ 450°F (10 barg @ 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

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

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 234.

PT-104 Mini Pump Trap Capacities

Motive Pressure		Total Lift or Back Pressure		Filling Head 6" (152 mm) Liquid Specific Gravity 0.9 - 1.0			
				Steam		Air	
psig	barg	psig	barg	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	1125	510	2 100	952
25	1.7			1300	590	2 200	998
50	3.5			1550	703	2 275	1 032
75	5.0			1650	748	2 300	1 043
100	7.0			1400	635	2 350	1 066
25	1.7	15	1.0	650	295	1 900	862
50	3.5			700	317	2 050	930
75	5.0			750	340	2 100	952
100	7.0			800	363	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	2.75	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 234.

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.



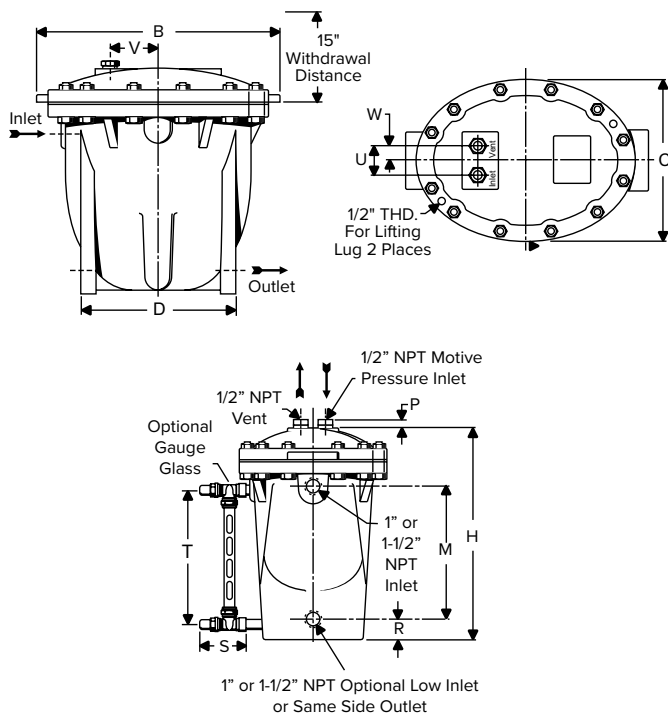
PT-200 Pumping Trap Materials

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 barg @ 232°C)

Maximum Operating Pressure 125 psig (9 barg)

PT-200 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-204	0.7		1		1.1		1.3	
	PT-206	0.7		1		1.1		1.3	

NOTE: Fill head is measured from drain point to top of cap. See figures on page 234.

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	1800	816	2100	953	2700	1225	3000	1361
25	1.7			2025	919	2300	1043	3200	1451	3500	1588
50	3.5			2100	953	2500	1134	3400	1542	3600	1633
75	5			2200	998	2700	1225	3500	1588	3700	1678
100	7			2300	1043	*	*	3600	1633	*	*
125	8.5			2400	1089	*	*	3700	1678	*	*
25	1.7	15	1	1500	680	2000	907	2400	1088	2700	1225
50	3.5			2000	907	2250	1021	3200	1451	3400	1542
75	5			2100	953	2500	1134	3300	1497	3500	1588
100	7			2110	957	*	*	3350	1520	*	*
125	8.5			2125	964	*	*	3400	1542	*	*
35	2.5	25	1.5	1500	680	1700	771	2100	953	2300	1043
50	3.5			1700	771	2000	907	2400	1089	2600	1179
75	5			1900	862	2300	1043	2700	1225	2900	1315
100	7			2000	907	*	*	2800	1270	*	*
125	8.5			2100	953	*	*	2900	1315	*	*
50	3.5	40	2.75	1400	635	1700	771	1500	680	2000	907
60	4			1500	680	2000	907	2000	907	2300	1043
75	5			1700	771	2200	998	2300	1043	2500	1134
100	7			1800	816	*	*	2400	1089	*	*
125	8.5			1920	871	*	*	2500	1134	*	*
70	4.5	60	4	1100	499	2000	907	1150	522	2000	907
75	5			1300	590	2300	1043	1325	601	2300	1043
100	7			1600	726	*	*	1900	862	*	*
125	8.5			1720	780	*	*	2000	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 234. 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 barg) 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.

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

Armstrong® 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

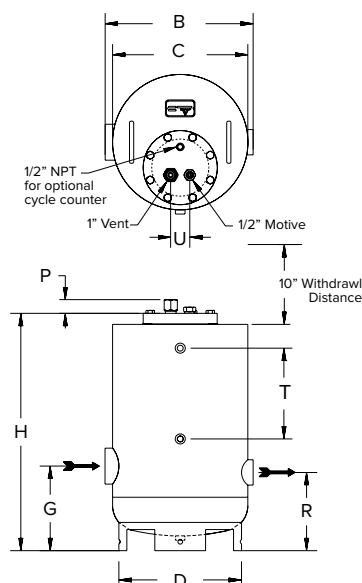
- Economical non-electric operation. Uses inexpensive steam, air or inert gas.
- Low-maintenance operation. No leaking seals, impeller or motor problems means lower maintenance. No NPSH issues.
- Lower installation costs. Single trade required for installation and maintenance.
- Peace of mind. Standard 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 Connection	1	25	1-1/2	40	2	50	3	80
Outlet Connection	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 Connection	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	
psig	barg	psig	barg	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	1900	862	2 250	1021	3 100	1406	3 350	1520	4 500	2 041	4 850	2 200	7 500	3 402	8 100	3 674
25	1.7			2 500	1134	2 650	1202	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	1406	3 225	1463	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	1542	3 500	1588	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	1588	*	*	5 400	2 449	*	*	7 300	3 311	*	*	12 100	5 488	*	*
125	8.5			3 600	1633	*	*	5 500	2 495	*	*	7 400	3 357	*	*	12 200	5 534	*	*
25	1.7	15	1	2 200	999	2 525	1145	3 500	1588	4 025	1826	5 400	2 449	6 200	2 812	7 200	3 266	8 275	3 753
50	3.5			2 600	1179	2 800	1270	4 100	1860	4 425	2 007	6 300	2 857	6 800	3 084	10 400	4 717	11 250	5 103
75	5			2 800	1270	2 950	1338	4 400	1996	4 750	2 155	6 500	2 948	6 900	3 130	10 800	4 899	11 450	5 194
100	7			3 100	1406	*	*	4 800	2 177	*	*	6 700	3 039	*	*	11 000	4 990	*	*
125	8.5			3 200	1451	*	*	4 900	2 222	*	*	6 800	3 084	*	*	11 200	5 080	*	*
35	2.5	25	1.5	2 000	907	2 350	1066	2 900	1315	3 425	1554	4 200	1905	4 950	2 245	6 900	3 130	8 150	3 697
50	3.5			2 400	1088	2 675	1213	4 000	1814	4 500	2 041	5 800	2 631	6 400	2 903	9 700	4 400	10 850	4 921
75	5			2 600	1179	2 800	1270	4 300	1950	4 550	2 064	6 000	2 721	6 500	2 948	10 000	4 536	10 900	4 944
100	7			2 800	1270	*	*	4 700	2 132	*	*	6 100	2 767	*	*	10 200	4 626	*	*
125	8.5			2 900	1315	*	*	4 800	2 171	*	*	6 400	2 903	*	*	10 400	4 717	*	*
50	3.5	40	2.75	1900	862	2 350	1066	3 300	1451	4 050	1837	4 350	1973	5 350	2 427	5 800	2 631	7 125	3 232
60	4			2 200	999	2 600	1179	3 600	1633	4 250	1927	5 100	2 313	6 000	2 722	6 900	3 130	8 150	3 697
75	5			2 400	1088	2 675	1213	4 000	1814	4 475	2 030	5 700	2 585	6 375	2 892	7 600	3 447	8 500	3 856
100	7			2 500	1135	*	*	4 200	1905	*	*	6 000	2 721	*	*	8 100	3 674	*	*
125	8.5			2 700	1225	*	*	4 500	2 041	*	*	6 200	2 612	*	*	8 500	3 856	*	*
70	4.5	60	4	1800	816	2 400	1088	3 200	1451	4 300	1950	3 800	1724	5 050	2 291	5 000	2 268	6 650	3 016
75	5			2 000	907	2 450	1111	3 500	1588	4 650	2 109	4 100	1859	5 175	2 347	5 400	2 450	6 900	3 130
100	7			2 300	1233	*	*	3 700	1678	*	*	4 500	2 041	*	*	6 000	2 722	*	*
125	8.5			2 400	1088	*	*	3 800	1724	*	*	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 234. 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 barg) 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.

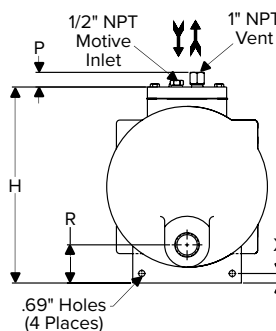
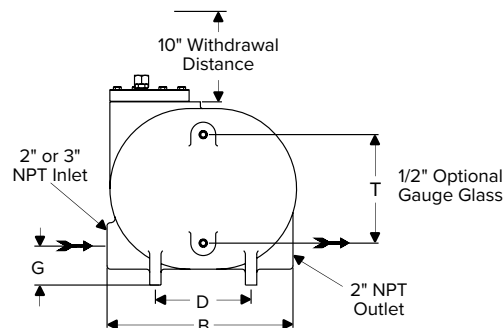
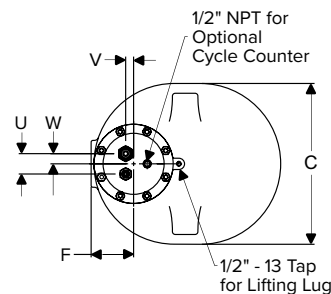
*Consult factory.

PT-400 Series Pumping Trap Materials	
Name of Part	Series PT-400*
Body and Cap	Fabricated steel 150 psig 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 234.



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 barg)

Maximum Allowable Pressure: Cast iron 150 psig @ 450°F (10 barg @ 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 0.9 - 1.0							
				PT-3508 2" x 2"				PT-3512 3" x 2"			
				Steam		Air		Steam		Air	
psig	barg	psig	barg	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	1.5	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	2.75	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 barg) 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 220.

*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 234.

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

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.



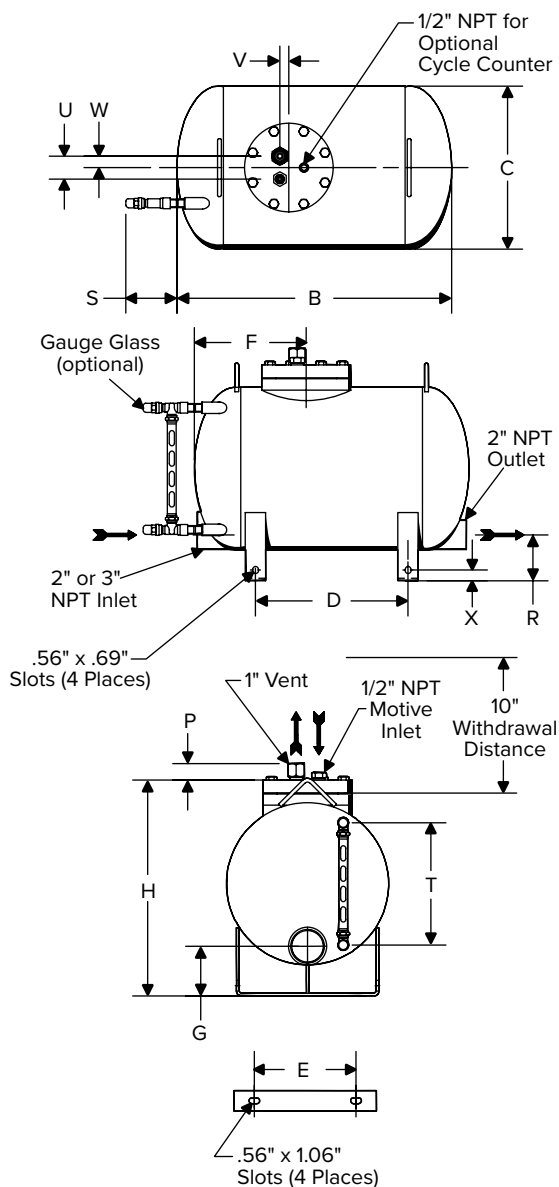
PT-300 Series Horizontal Steel, Low Profile Pump Trap



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"	13	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 barg @ 343°C)
 Maximum Operating Pressure: 125 psig (9 barg)
 *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 psig 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 Glass Connection	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	barg	psig	barg	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	2.75	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 234. 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 barg) 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	in	mm
		0	0	6	152	12	305	24	610	36	914
Model	PT-308	0.7		0.85		1.0		1.2		1.3	
	PT-312	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 234.

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—

Armstrong® PT-100/200/300/3500/400/DD-4/DD-6/PT-6F 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 217 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 barg)
(25 foot vertical lift = 10.8 psig, 14 psig in condensate return line).
- Motive pressure is steam at 50 psig (3.5 barg).

Solution: Model PT-3508

Find 25 psig total lift or back pressure in column two of Low Profile Pump Trap Capacities table on page 217. 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 217 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 221 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
 $7\ 100\ \text{lb/hr} \times 0.03 = 213\ \text{lb/hr flash steam}.$

Using the Vented Receiver Sizing table on page 221, 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 221 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 221. 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 barg—By dividing by 14.5 Example: $15\ \text{psig} \div 14.5 = 1.03\ \text{barg}$

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

Sizing and Selection—

PT-100/200/300/3500/400/DD-4/DD-6/PT-6F Series



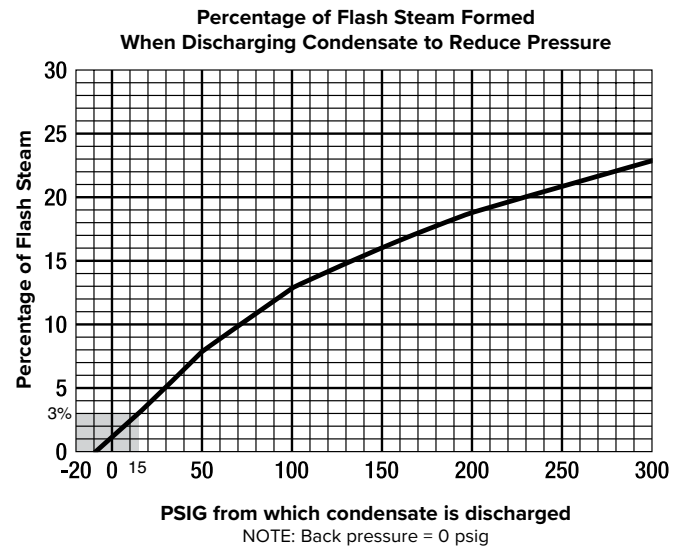
Condensate
Recovery
Equipment

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	36	914	2-1/2	65
500	227	10	254			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.



Description

Armstrong's PT-6F pump trap offers a low profile non-electric solution to move condensate from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. The PT-6F is an ASME code-stamped carbon steel vessel, and will return condensate at temperatures well above the 200°F (93°C) limit of conventional electric pumps.

Features

- Low-maintenance, non-electric operation. No leaking seals, impeller or motor problems. No NPSH issues.
- Externally removable vent and motive seats
- ASME Section VIII "U" stamped vessel
- Space-saving size, low-profile body fits in tight spaces
- ASME Carbon Steel durability, Inconel X-750 springs and all stainless steel internals for long service life
- Lower installation costs. Single trade installation
- Safety. The pump can be used in pits or sumps without fear of electrocution or circuit breaker defaults.

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)

Materials

Body: Carbon Steel
Springs: Inconel X-750
Internals: Stainless Steel

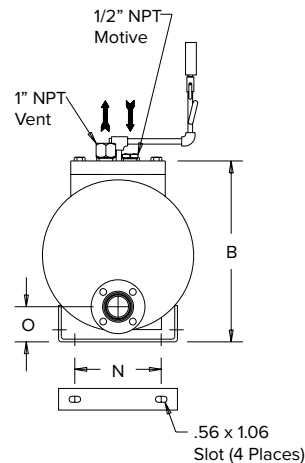
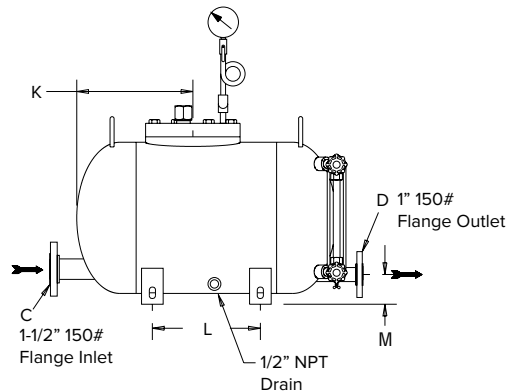
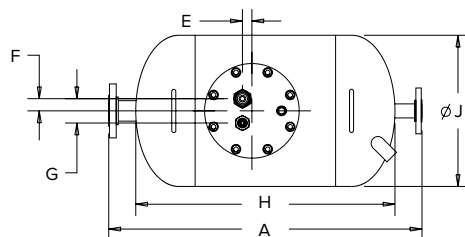
(Consult factory for different pressure/temperature ratings and materials)

For a fully detailed certified drawing, refer to CD2913.

PT-6F 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)	



PT-6F



PT-6F

Low Profile Pump Trap



Condensate
Recovery
Equipment

PT-6F Pump Capacities							
Motive		Back Pressure		Steam Motive		Air Motive	
psig	barg	psig	barg	lb/hr	kg/hr	lb/hr	kg/hr
15	1	5	0.34	2 400	1 089	3 600	1 632
25	1.7			3 000	1 361	4 500	2 040
50	3.5			4 000	1 814	5 500	2 494
75	5			4 500	2 041	6 000	2 721
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	4 000	1 814
50	3.5			2 800	1 270	4 500	2 045
75	5			3 400	1 542	5 000	2 267
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	1.5	1 800	816	3 500	1 587
50	3.5			2 300	1 043	4 500	2 040
75	5			2 900	1 315	4 800	2 176
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	2.75	1 400	635	3 500	1 587
75	5			2 000	907	4 400	1 995
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	3 300	1 496
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.

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
Capacity Multiplier	0.7	.85	1.0	1.08	* Consult factory

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

Description

Armstrong's PT-12F pump trap offers a non-electric solution to move condensate from low points, low pressures or vacuum spaces to an area of higher elevation or pressure. The PT-12F is an ASME code-stamped carbon steel vessel, capable of returning condensate at temperatures well above the 200°F (93°C) limit of conventional electric pumps.

Features

- Low-maintenance, non-electric operation. No leaking seals, impeller or motor problems. No NPSH issues.
- Externally removable vent and motive seats
- ASME Section VIII "U" stamped vessel
- Lower installation costs. Single trade installation.
- ASME Carbon Steel durability, Inconel X-750 springs and all stainless steel internals for long service life
- Safety. The pump can be used in pits or sumps without fear of electrocution or circuit breaker defaults.

Maximum Operating Conditions

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

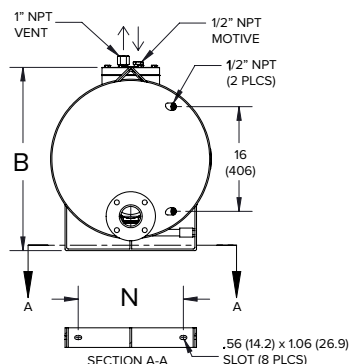
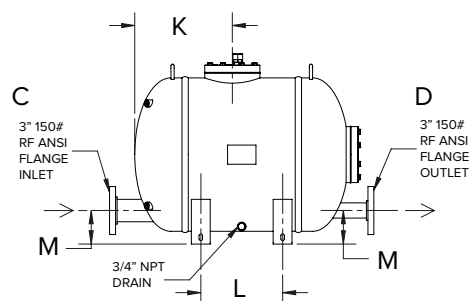
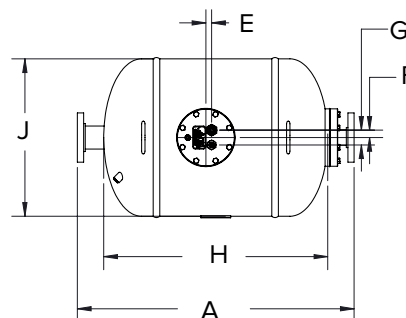
Maximum operating pressure:
200 psig @ 400°F (14 bar @ 204°C)
(Consult factory for different pressure/temperature ratings and materials)

Materials

Body: Carbon Steel
Springs: Inconel X-750
Internals: Stainless Steel

For a fully detailed certified drawing, refer to CD2914.

PT-12F Physical Data		
	in	mm
"A"	42	1067
"B"	28	711.5
"C"	3	80
"D"	3	80
"E"	7/8	22
"F"	1-1/8	28
"G"	2-1/4	57
"H"	34	864
"J"	24	610
"K"	15-1/2	394
"L"	13	330
"M"	5-1/4	133
"N"	16	406
Weight lb (kg)	348 (158)	



PT-12F

High Capacity Pump Trap

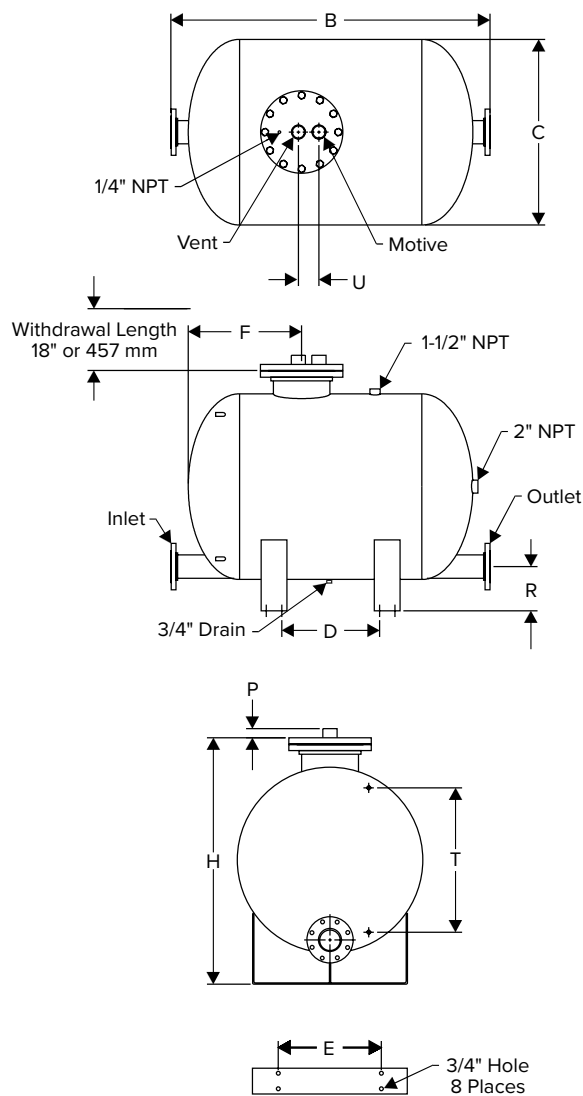


PT-12F Pump Capacities							
Motive		Back Pressure		Steam Motive		Air Motive	
psig	barg	psig	barg	lb/hr	kg/hr	lb/hr	kg/hr
15	1	5	0.34	9 800	4 445	15 800	7 166
25	1.7			12 900	5 851	17 800	8 073
50	3.5			16 500	7 484	18 800	8 526
75	5			18 200	8 255	19 500	8 844
100	7			18 900	8 573	-	-
125	8.5			19 300	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	14 000	6 349
50	3.5			12 900	5 851	17 500	7 937
75	5			14 800	6 713	18 300	8 299
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	1.5	7 200	3 266	12 700	5 760
50	3.5			10 300	4 672	15 600	7 075
75	5			12 300	5 579	16 800	7 619
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	2.75	6 700	3 039	12 100	5 488
75	5			9 500	4 309	14 700	6 667
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	10 900	4 943
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	9 600	4 354
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. Fill head measured from drain point to top of pump case.

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
Capacity Multiplier	0.7	.85	1.0	1.08	* Consult factory

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



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	

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 FH1367.

PT-516 High Capacity Pump Trap Physical Data		
	in	mm
Inlet Connection	4 150# ANSI Flg.	100 150# ANSI Flg.
Outlet Connection	4 150# ANSI Flg.	100 150# ANSI Flg.
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 barg).

For higher pressure, consult factory.

Maximum Allowable Pressure (standard vessel design): 150 psig @ 500°F (10 barg @ 277°C).

300 psig (21 barg) vessel available upon request.

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 psig 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 psig ASME vessel available upon request. PT-516 available in all stainless steel. Consult factory.

Condensate
Recovery
Equipment

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						Motive Pressure	Total Lift or Back Pressure		4" x 4" Connections 24" Fill Head				
				Steam Motive		Air Motive							Steam Motive		Air Motive		
psig	barg	psig	barg	lb/hr	kg/hr	lb/hr	kg/hr			psig	barg	psig	barg	lb/hr	kg/hr	lb/hr	kg/hr
15	1.0	5	0.34	28 962	13 137	57 619	26 136			35	2.5	25	1.5	29 212	13 251	46 238	20 973
25	1.7			37 162	16 857	61 911	28 083	50	3.5	33 413	15 156			50 962	23 116		
35	2.5			42 563	19 307	64 738	29 365	60	4	35 672	16 181			53 376	24 211		
50	3.5			48 288	21 903	67 735	30 725	70	4.5	37 646	17 076			55 418	25 138		
60	4			51 214	23 231	69 267	31 420	75	5	38 548	17 485			56 313	25 544		
70	4.5			53 688	24 138	70 562	32 007	100	7	42 454	19 257			60 141	27 280		
75	5			54 796	24 855	71 142	32 270	125	8.5	45 649	20 706			*	*		
100	7			59 414	26 950	73 559	33 366	150	10.34	*	*			*	*		
125	8.5	15	1	62 995	28 575	*	*			50	3.5	40	2.75	26 210	11 889	41 244	18 708
150	10.34			65 922	29 902	*	*	60	4	27 353	12 407			44 028	19 971		
25	1.7			36 720	16 656	50 783	23 035	70	4.5	28 319	12 846			46 382	21 039		
35	2.5			40 611	18 421	54 293	24 627	75	5	28 752	13 042			47 435	21 517		
50	3.5			45 196	20 501	58 013	26 315	100	7	30 555	13 860			51 828	24 022		
60	4			47 740	21 655	59 915	27 177	125	8.5	31 954	14 494			*	*		
70	4.5			50 005	22 682	61 523	27 907	150	10.34	33 097	15 013			*	*		
75	5			51 054	23 159	62 243	28 233	70	4.5	25 973	11 781			32 026	14 527		
100	7	55 675	25 254	65 243	29 594	75	5	26 373	11 963	33 514	15 202						
125	8.5	59 552	27 013	*	*	100	7	28 042	12 720	40 951	18 575						
150	10.34	62 923	28 542	*	*	125	8.5	29 336	13 307	*	*						
						150	10.34	30 394	13 787	*	*						
						70	4.5	23 892	10 837	34 893	15 827						
						75	5	24 231	10 991	*	*						
						100	7	24 570	11 145	*	*						
						125	8.5										
						150	10.34										

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-12F/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.

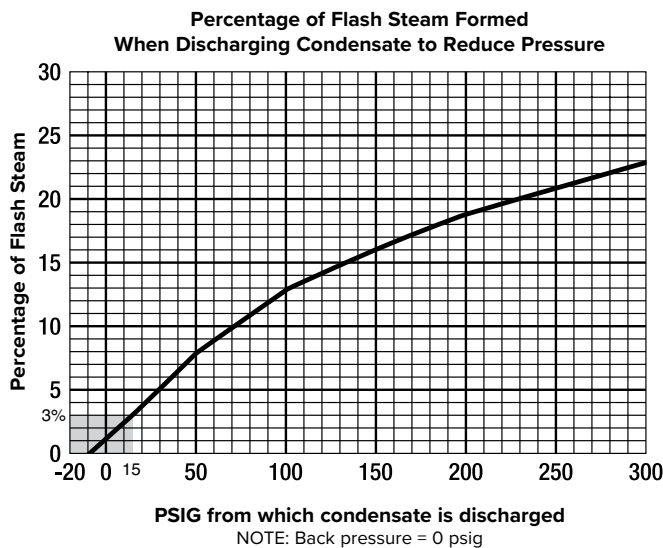
For Vented Receiver Sizing

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 x .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.



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 234) 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.

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 234). 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 barg)

Motive Pressure

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

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 215 and 219.

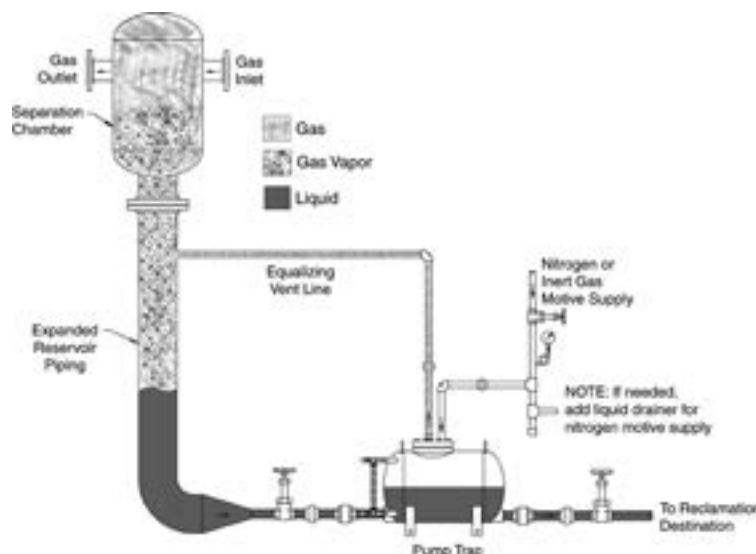
Consult Armstrong for engineered pre-piped receiver packages.



PT-300LL Light Liquid Pump Trap



PT-400LL Light Liquid Pump Trap



Hydrocarbon Knockout Drum Separator

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.



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 barg @ 160°C)

Maximum operating pressure:

DD-4 72 psig @ 320°F (5 barg @ 160°C)

Materials

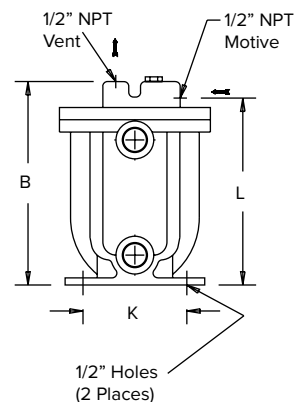
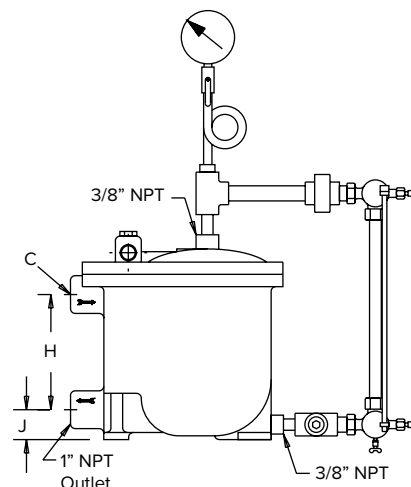
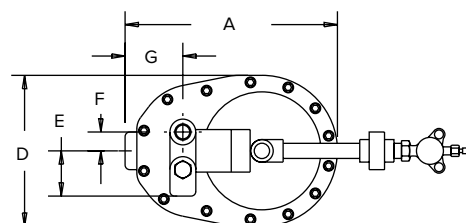
Body:	Ductile iron
Mechanism:	All stainless steel
Springs:	304 Stainless steel
Float:	All stainless steel

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	
psig	barg	psig	barg	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	1.5	220	100
50	3.5			325	147
70	4.5			348	158
50	3.5	40	2.75	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	
psig	barg	lb/hr	kg/hr
5	0.34	1 342	610
10	0.7	1 980	900
20	1.4	2 860	1 300
30	2.1	3 410	1 550
40	3	3 795	1 725
50	3.4	4 070	1 850
60	4.1	4 235	1 925
70	4.8	4 400	2 000

Condensate
Recovery
Equipment

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 barg @ 204°C)

Maximum operating pressure:

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

Materials

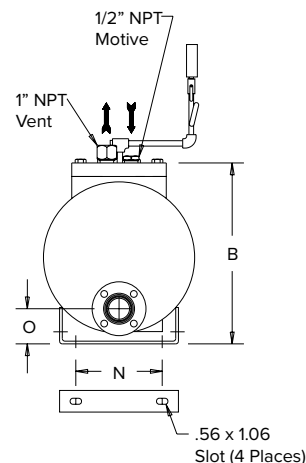
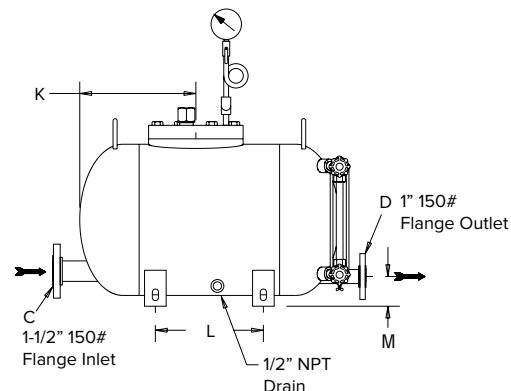
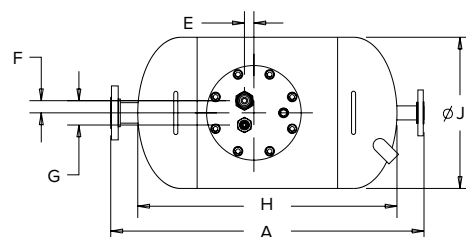
Body: ASME Code Stamped Carbon Steel
 Springs: Inconel X-750
 Internals: All stainless steel

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	
psig	barg	psig	barg	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	1.5	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	2.75	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	
psig	barg	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	1.5	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.

Condensate
Recovery
Equipment



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 barg @ 204°C)

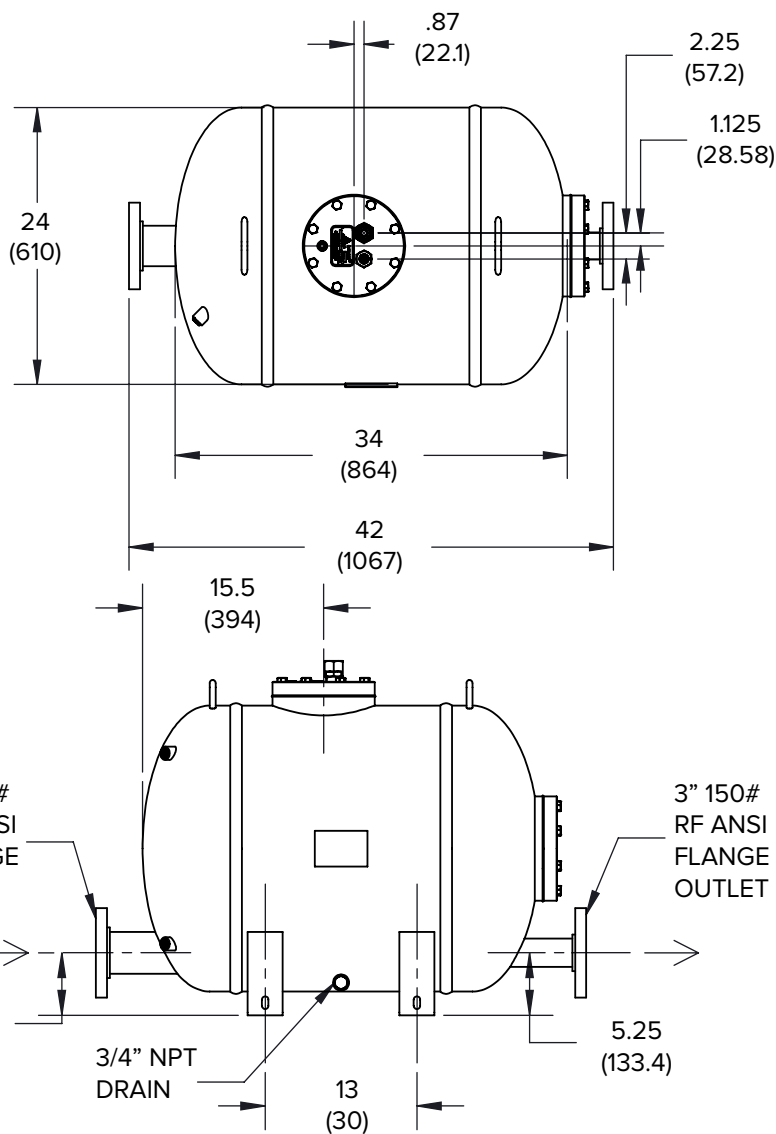
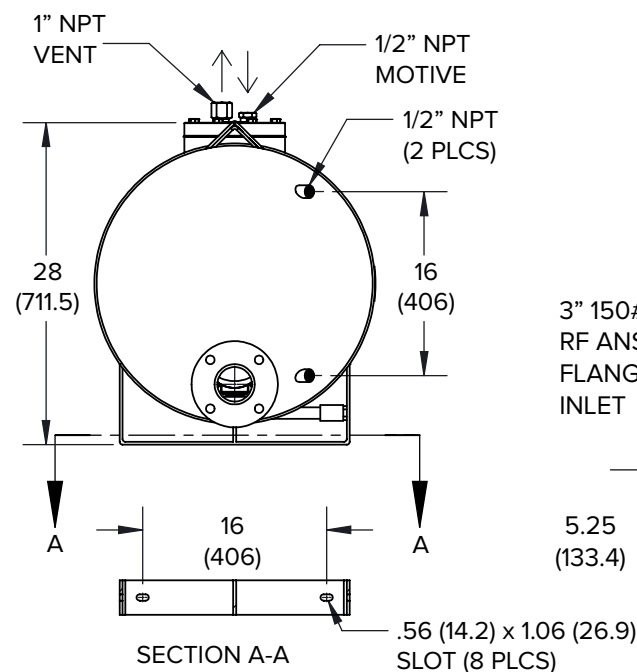
Maximum operating pressure: 200 psig @ 400°F (14 barg @ 204°C)

(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	
psig	barg	psig	barg	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	1.5	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	2.75	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

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

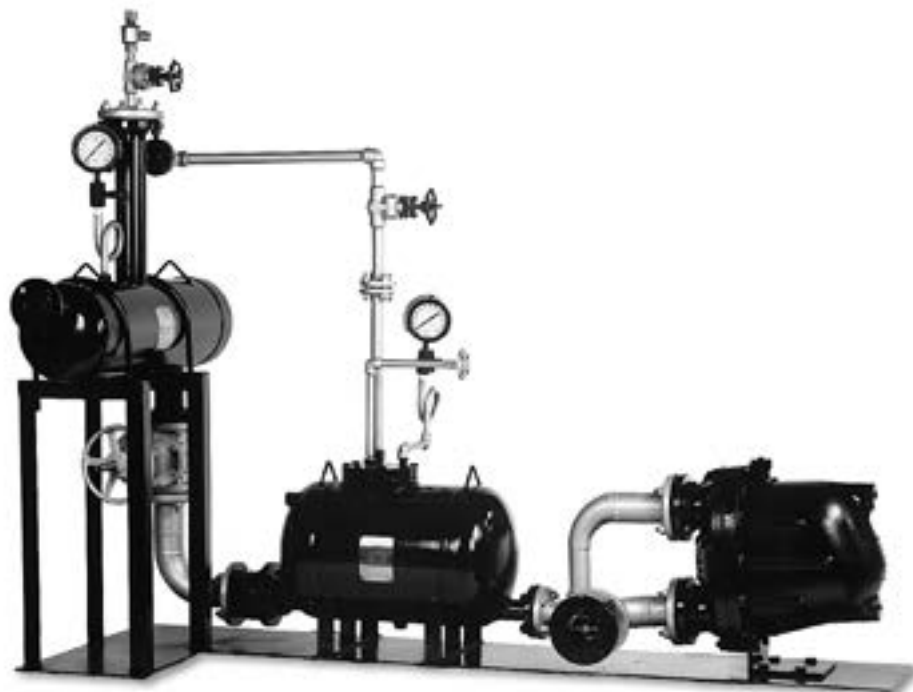
Double Duty® 12 Trap Capacities			
Differential Pressure		Capacity	
psig	barg	lb/hr	kg/hr
2	.14	21 500	9 752
5	.34	28 700	13 018
10	.7	35 900	16 284
25	1.5	52 100	23 632
50	3.5	59 600	27 034
75	5.2	72 000	32 659
100	6.9	81 000	36 741
150	10.3	93 000	42 184

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

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

Condensate
Recovery
Equipment

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



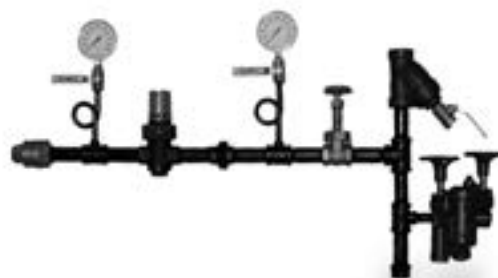
Armstrong's standard simplex (shown), duplex, triplex or quadraplex packages are unparalleled in quality and craftsmanship.

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)

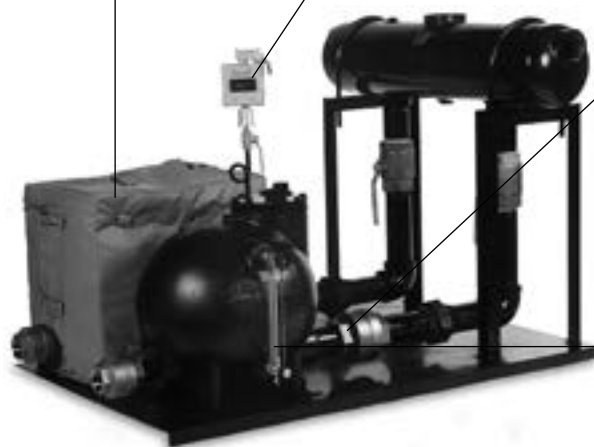
Digital Cycle Counters

- 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

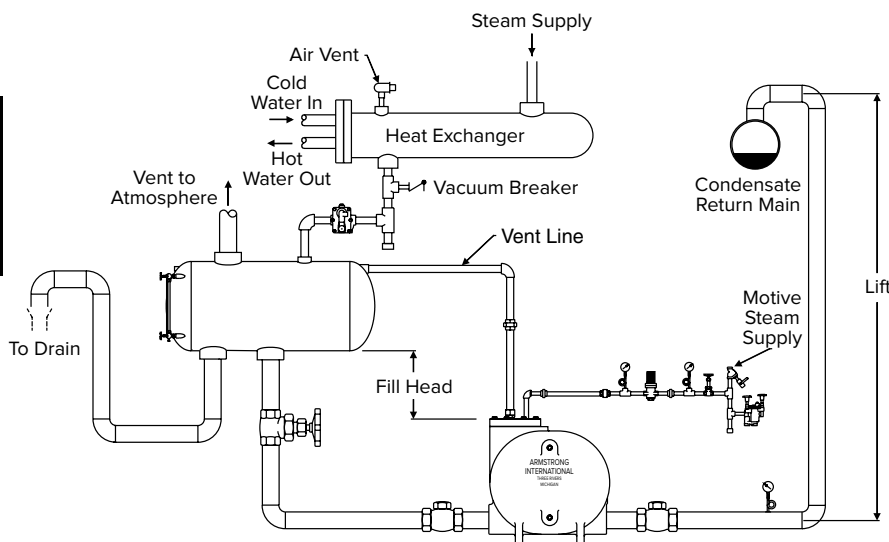
- Stainless steel in-line non-slam check valves
- Bronze/stainless steel (standard)
- Cast steel/stainless steel wafer-style (flanged pumps)
- Stainless steel/stainless steel wafer-style (flanged pumps)
- Bronze (standard)

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.



Multiple or single traps discharging to vented receiver.

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 221 and 224 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.

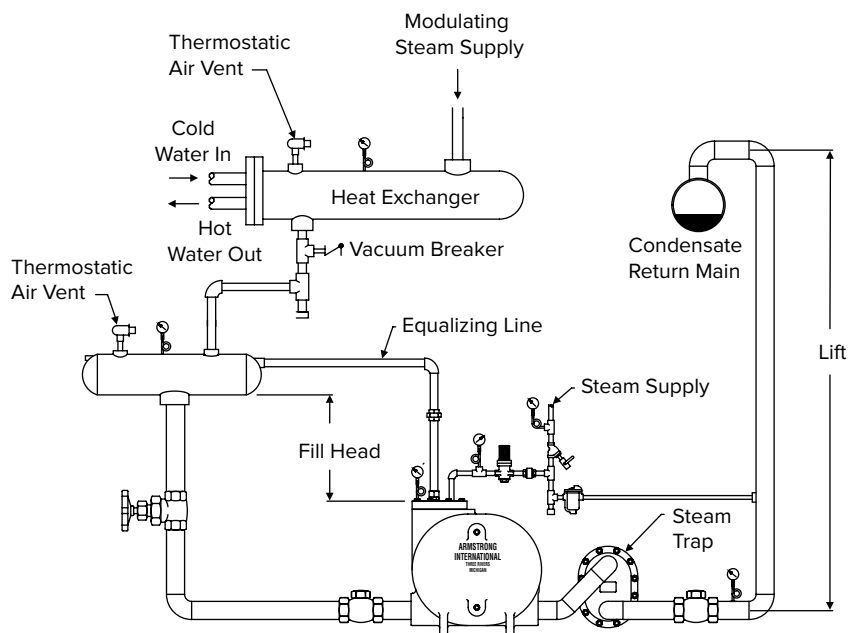
CLOSED SYSTEMS

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 221 and 224 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.

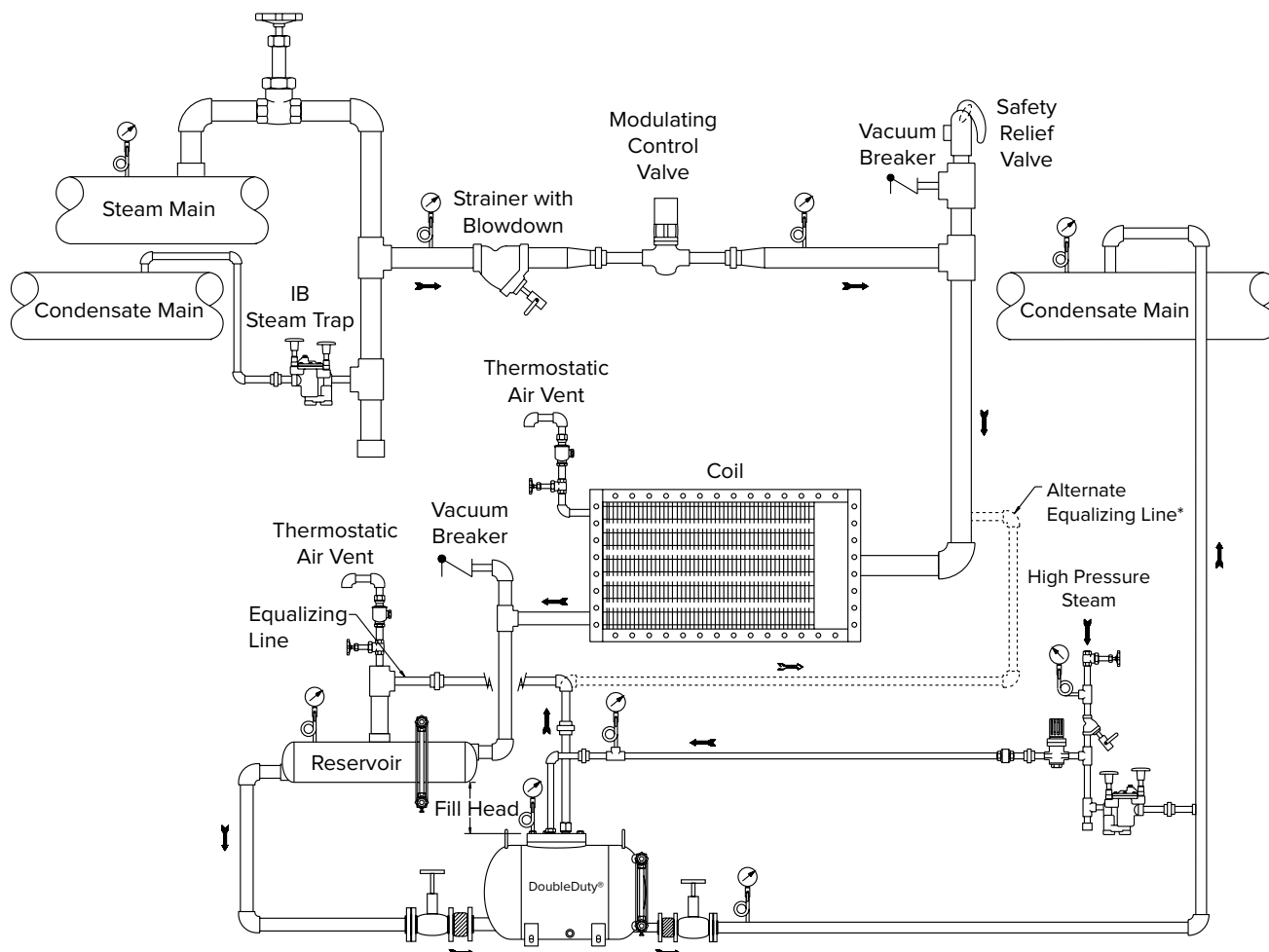
Note 2: Vent piping from the pump trap can be connected to the inlet side of the equipment being drained if the pressure drop across the equipment is less than .5 psig (0.03 barg) and there is a minimum of 24" (609 mm) of fill head present.

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.



Draining steam coil or heat exchanger when steam pressure may exceed the return line pressure, a steam trap is required on the discharge side of the pump trap. Request installation and operation manual IB-100.

Double Duty® Typical Application



*Used only if pressure drop across coils is less than 1/2 psi.

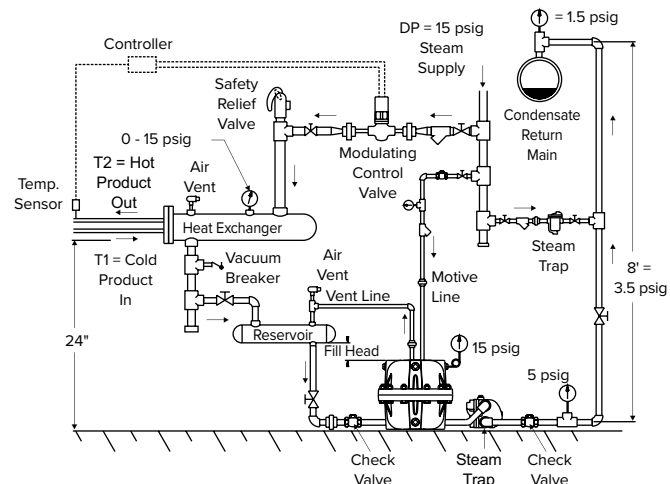
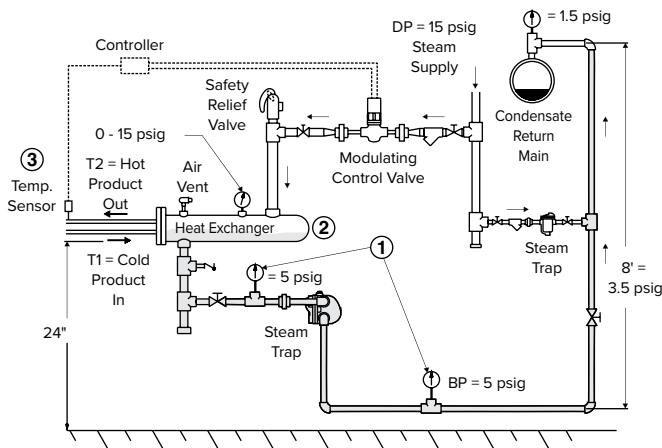
Common Applications for Condensate Armstrong Pump Traps

- 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

Condensate Recovery 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.

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 234 for vented system arrangement.

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 15 psig
BP = back pressure
T1 = incoming temperature
T2 = exit temperature
MT = mean temperature

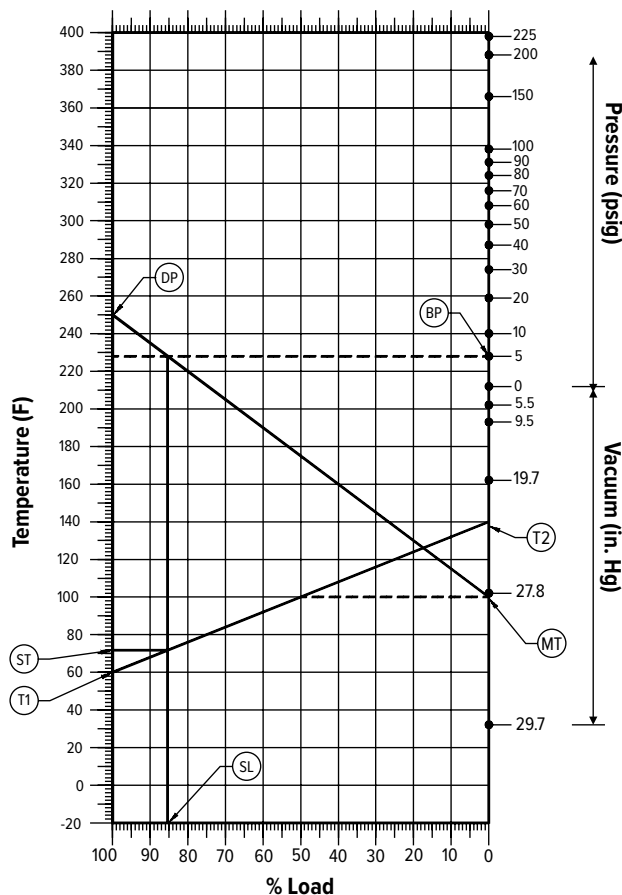
Example

5 psig
60°F
140°F
100°F

Stall Information:

SL = stall load %
ST = stall load temperature

85%
72°F



Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

Notes



Rescue Cap® Non-Electric Steam/Air Powered Pump Retrofit Assembly



Do you experience maintenance problems with non-electric steam/air powered pumps?

Are you dumping valuable condensate because of frequent maintenance?

Do you experience spring failures?

Do you have to remove the complete cap assembly to view, clean or replace the motive or vent valve?

Condensate
Recovery
Equipment

Externally replaceable valve and seat assembly

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

Wear and corrosion resistance

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

Long life and dependable service

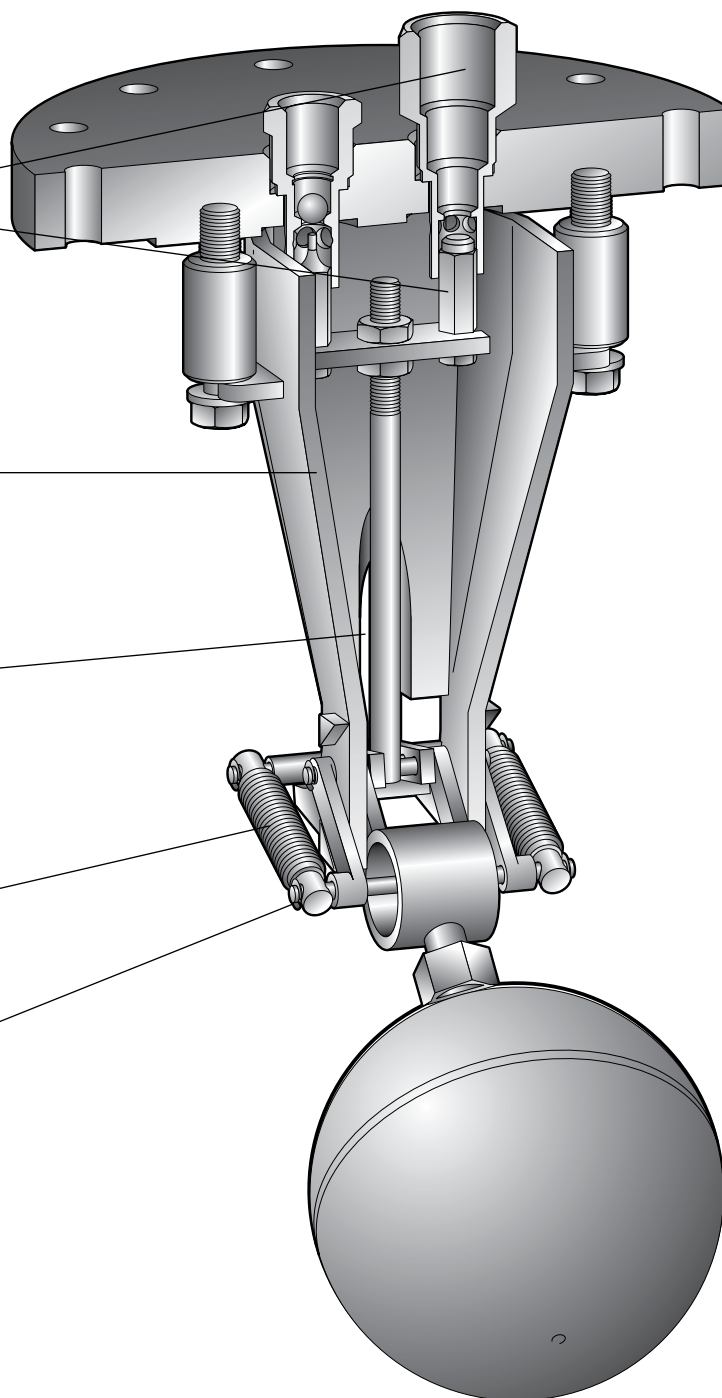
Simple float/spring operation and rugged all stainless steel construction allow for long, trouble-free service life.

Stress chloride corrosion resistance

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

Bushings

Reduce friction and wear on pivot points



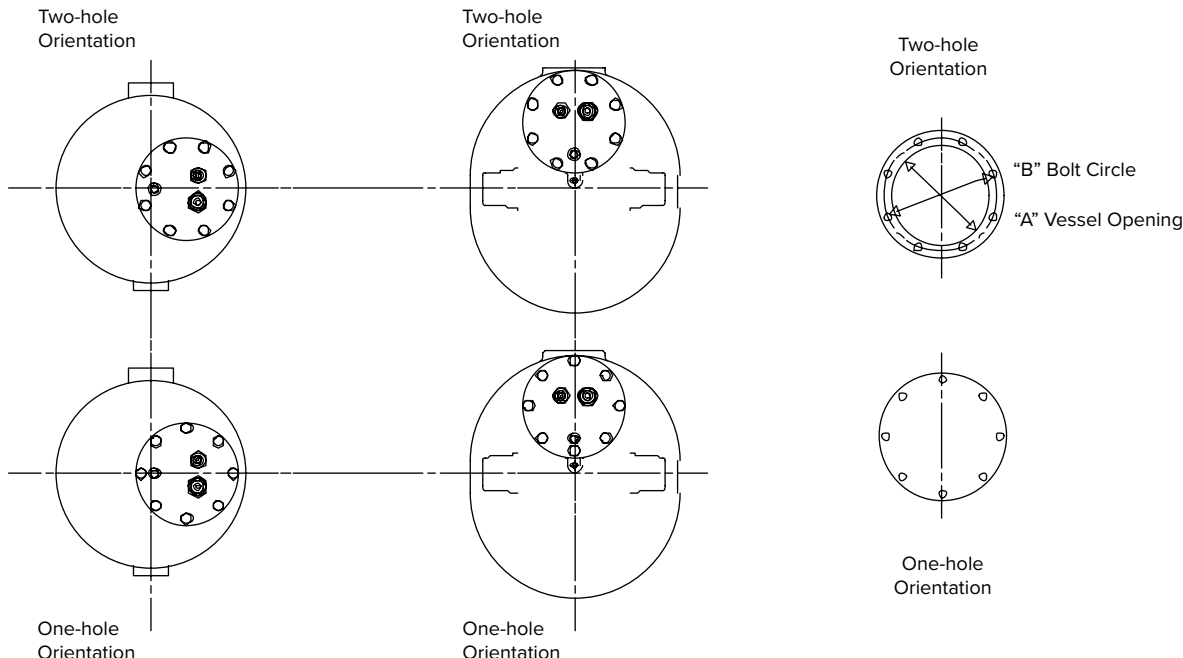
Rescue Cap® Non-Electric Steam/Air Powered Pump Retrofit Assembly



Condensate
Recovery
Equipment

Armstrong's non-electric steam/air powered pump retrofit cap and mechanism assembly fits most competitive models. To ensure proper fit, please provide the following information:

- Manufacturer's name: _____
- Manufacturer's model number: _____
- Number of bolt holes in cap: _____
- Bolt circle dimension "B": _____
- Inside diameter of vessel opening "A": _____
- Bolt hole orientation (one hole or two holes): _____



Rescue Cap® Non-Electric Steam/Air Powered Pump Retrofit Assembly							
Illustration	Fits Competitors' Mechanical Pumps Listed Below						
	Spirax Sarco Models PTC & PTF PPC & PPF	Watson McDaniel Models PMPC & PMP	Spence & Nicholson Condensate Commanders	KADANT Johnson Corporation	ITT Hoffman PCS	Yarway Series 65 Steel	Clark Reliance

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.



Armstrong® FHC / FHS Series Electric Condensate Pumps

Armstrong FHC (cast iron) and FHS (steel) electric condensate pumps are offered as packaged units, pre-assembled, wired and factory tested.

Features

- Heavy duty, ballbearing, close-coupled pump motors with stainless steel shaft. 3450 RPM for greater efficiency and more economical operation.
- Level controls with two-pole, drip proof case, stainless steel float and float rod, doublebreak silver-to-silver contacts. Float travel adjustment is easy, visible and accessible.
- Pump mounting design provides efficient operation and extended life by venting air and flushing seal area.
- Offers a wide range of pressures and GPM. Unique design for easy maintenance.
- Pumps made of durable cast iron for extended life; efficient design provides maximum capacity with minimum motor load.
- The ultimate in ceramic technology for extended life. The seal runs on the brass impeller hub with the motor shaft actually outside the pump body. Therefore, the shaft is not exposed to corrosion by condensate. Recommended for temperatures up to 250°F (120°C).



Please visit our web site, armstronginternational.com, for detail information regarding dimensions and weights.

For control panel information and optional items, please refer to page 231.

Specifications - FHC Cast Iron Receiver Condensate Pumps								
Model No.		Pump GPM	Standard Motor Voltage*	Maximum Pump Discharge, psig	Pump Discharge Nozzle Size	Pump HP	Receiver Size Gallons	sq ft EDR
Simplex	Duplex							
FHC-112	FHC-212	12	115V/1Ph 3500 RPM	20	3/4"	1/3	15	8 000
FHC-122	FHC-222	22				1/2	24	15 000

Specifications - FHS Carbon Steel Receiver Condensate Pumps								
Model No.		Pump GPM	Standard Motor Voltage*	Maximum Pump Discharge, psig	Pump Discharge Nozzle Size	Pump HP	Receiver Size Gallons	sq ft EDR
Simplex	Duplex							
FHS-4028G	—	12	115V/1Ph 3500 RPM	20	3/4"	1/3	8	8 000
FHS-112	FHS-212					1/3	15	
FHS-122	FHS-222	22				1/2	30	15 000
—	FHS-230	30				3/4		20 000

*Can be field wired to 230V/1Ph/60Hz

Additional units for larger capacities and higher pressures available upon request.
Pumps have cast iron bodies.

FHC / FHS Series Electric Condensate Pumps

Sizing Condensate Pumps

Step 1—Determine the condensing rate of the system:

Where: C = Condensing Rate in lb/hr
 F_1 = Conversion to GPM = 500
 F_2 = Conversion to EDR = .0005

Formula: $C \div F_1 = \text{GPM}$
 $\text{GPM} \div F_2 = \text{sq. ft. EDR}$

Example: $2000 \text{ lb/hr} \div 500 = 4 \text{ GPM}$
 $4 \text{ GPM} \div 0.0005 = 8\,000 \text{ sq. ft. EDR}$

Step 2—Apply a 3:1 safety factor by multiplying by 3

Example: $4 \text{ GPM} \times \text{safety factor of } 3 = 12 \text{ GPM}$
 Select a pump with a 12 GPM rating with
 a sq. ft. EDR of 8 000

Step 3—Determine system back pressure

The total back pressure is determined by vertical lift, system pressure on the discharge side of the pump, plus frictional loss through pipe, valves and fittings.

Vertical lift, 2.31 ft. = 1 psig + system pressure (psig) + frictional loss (psig) = total system back pressure.

Select a pump that has a maximum discharge pressure greater than the total system back pressure calculated for the system.

Special Notes:

- Floor mounted condensate receivers have a maximum operating temperature rating of 200°F. Higher temperature applications will require that the receiver be elevated to achieve proper net positive suction head (NPSH).
- Duplex units are typically sized for system redundancy, using a mechanical alternator for less wear on each pump.
- For systems that require vacuum pumps, control panels, high performance motors and special condensate receivers, consult the factory for engineering and pricing assistance.
- Condensate receivers are typically sized for one to three minutes of storage capacity.
- The condensate receiver that is mounted to the pump must always remain vented to the atmosphere.

NPSH is critical to the proper operation of an electric condensate pump. NPSH is the measure of how close the suction passage of the pump is to boiling. NPSH can be calculated by the following formula: $\text{NPSH} = H_s + H_p - H_v - H_f$

Where:

H_s = static head of the liquid at the pump suction
 H_v = vapor pressure of the liquid at the pump suction

H_p = absolute pressure above the static head of the liquid
 H_f = friction loss in the suction piping



Sizing for Electric Condensate Package

Date: _____ Representative: _____
Salesperson: _____ Application: _____
Customer: _____ Customer Location: _____

Pump GPM required* (with 3:1 safety factor) _____

Determine pump discharge:

Friction loss of pipe _____

Vertical lift _____

If pumping into a pressurized line (add pressure of line) _____

Add 5 psig safety factor _____

Total psig _____

Standard packages rated to pump up to 200°F condensate

Temperature of condensate _____

Motor voltage and phase _____

Material of receiver: ☐ Steel ☐ Cast Iron ☐ Stainless Steel

Motor enclosure: ☐ ODP ☐ TEFC* ☐ Explosion Proof*

Is a control panel needed: ☐ Yes ☐ No

NEMA rating: ☐ NEMA 12 ☐ NEMA 4*

Type of alternator on a duplex: ☐ Mechanical ☐ Electric

Condensate Return Schedule

Model Number _____

Capacity _____ GPM at _____ PSIG

_____ HP _____ RPM

Receiver _____ gallons

Current _____ phase, 60 cycles, _____ volts

Options included on package:

*It is acceptable to use a 2:1 safety factor if the actual loads are known. If actual load is unknown, use standard 3:1 safety factor.

4100/4600, 4200/4700, 4300/4800, 4400 Series Condensate Boiler Feed Pumps



Series 4100/4600 Condensate and Boiler Feed

- Heavy gauge 3/16" steel receivers for long service life
- 3450 rpm motors for maximum efficiency with minimum horsepower
- Simplex/Duplex
- Wide range of options available
- Standard Units: 3 gpm – 75 gpm
- 4100 rated up to 200 deg F condensate, 4600 rated up to 210/212 deg F condensate
- Consult factor for additional sizes



Series 4200/4700 Condensate and Boiler Feed

- Heavy duty cast iron receivers for long service life
- 3450 rpm motors for maximum efficiency with minimum horsepower
- Simplex/Duplex
- Wide range of options available
- Standard Units: 3 gpm – 75 gpm
- 4200 rated up to 200 deg F condensate, 4700 rated up to 210/212 deg F condensate
- Consult factor for additional sizes



Series 4300/4800 Condensate and Boiler Feed

- Heavy gauge 3/16" stainless steel receivers for long service life
- 3450 rpm motors for maximum efficiency with minimum horsepower
- Simplex/Duplex
- Wide range of options available
- Standard Units: 3 gpm – 75 gpm
- 4300 rated up to 200 deg F condensate, 4800 rated up to 210/212 deg F condensate
- Consult factor for additional sizes



Series 4400 Condensate and Boiler Feed

- Stainless Steel Receivers and Stainless Steel centrifugal pumps for long service life
- 3450 rpm TEFC motors for maximum efficiency with minimum horsepower
- Simplex/Duplex
- Wide range of options available
- Standard Units: 3 gpm – 150 gpm



Carbon Steel Receiver Electric Pump Packages

Condensate
Recovery
Equipment

AFH-4100 Series Carbon Steel Electric Condensate Pump Packages											
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size In.	Inlet Size In.	
8 000	20	12	1/3	8	AFH-4028-G	—	90	—	3/4"	2"	
2 000	20	3		15	AFH-4128-G	AFH-4128-GDA	125	185			
4 000		6									
6 000		9									
8 000		12									
10 000		15	30						AFH-41215-G	AFH-41215-GDA	190
15 000		22.5		45	AFH-41220-G	AFH-41220-GDA	200	250			
20 000		30	45		AFH-41225-J	AFH-41225-JDA	285	350	1-1/2"		
25 000		37.5		45	AFH-41230-J	AFH-41230-JDA					
30 000		45	1		AFH-41240-J	AFH-41240-JDA	335	405			
40 000		60	1-1/2	60	AFH-41250-J	AFH-41250-JDA	385	460			
50 000		75	2	95	AFH-41250-J	AFH-41250-JDA	385	460			
2 000	30	3	1/2	15	AFH-4138-J	AFH-4138-JDA	180	250	1-1/2"	2"	
4 000		6									
6 000		9									
8 000		12									
10 000		15									3/4
15 000		22.5	1	30	AFH-41320-J	AFH-41320-JDA	230	300		2-1/2"	
20 000		30			45	AFH-41325-J	AFH-41325-JDA	285			350
25 000		37.5				AFH-41330-J	AFH-41330-JDA	290			355
30 000		45	1-1/2			AFH-41340-J	AFH-41340-JDA	340			410
40 000		60	2		60	AFH-41350-J	AFH-41350-JDA	395			470
50 000		75	3	95	AFH-41350-J	AFH-41350-JDA	395	470			
2 000	40	3	1	15	AFH-41410-J	AFH-41410-JDA	190	270	1-1/2"	2"	
4 000		6									
6 000		9									
8 000		12									
10 000		15									1-1/2
15 000		22.5	45	AFH-41425-J	AFH-41425-JDA	290	355				
20 000		30		AFH-41430-J	AFH-41430-JDA	295	360				
25 000		37.5		2	AFH-41440-J	AFH-41440-JDA	340	410			
30 000		45	45		AFH-41450-J	AFH-41450-JDA	395	470			
40 000		60			30	AFH-41510-J	AFH-41510-JDA	195		275	
50 000		75		3		95	AFH-41510-J	AFH-41510-JDA		195	275
2 000	3	2	15	AFH-41510-J		AFH-41510-JDA	195	275			
4 000	6										
6 000	9										
8 000	12										
10 000	15										
15 000	22.5	1-1/2	30	AFH-41515-J	AFH-41515-JDA	245	320				
20 000	30			45	AFH-41520-J	AFH-41520-JDA	255	330			
25 000	37.5				45	AFH-41530-J	AFH-41530-JDA	305	385		
30 000	45	5				AFH-41540-S	AFH-41540-SDA	370	500		
40 000	60			95		AFH-41550-S	AFH-41550-SDA	430	560		
50 000	75		AFH-41550-S		AFH-41550-SDA	430	560				

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.
Pumps rated to 200°F maximum condensate temperature.
Models with higher capacities or discharge pressures available upon request.
Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.
Pumps have cast iron bodies.

Cast Iron Receiver Electric Pump Packages

AFH-4200 Series Cast Iron Electric Condensate Pump Packages										
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size Inches	Inlet Size Inches
2 000	20	3	1/3	6	AFH-4224-G	—	150	—	3/4"	2"
4 000		6								
6 000		9								
8 000		12		15	AFH-4228-G	AFH-4228-GDA	260	295		
10 000		15	1/2		AFH-42210-G	AFH-42210-GDA				
15 000		22.5		24	AFH-42215-G	AFH-42215-GDA	300	335		
20 000		30	3/4		AFH-42220-G	AFH-42220-GDA	410	445		
25 000		37.5		36	AFH-42225-J	AFH-42225-JDA	350	420		
30 000		45	1		AFH-42230-J	AFH-42230-JDA	355	430	1-1/2"	3"
40 000		60	1-1/2	50	AFH-42240-J	AFH-42240-JDA	420	500		
50 000		75	2		AFH-42250-J	AFH-42250-JDA	425	510		
2 000	30	3	1/2	6	AFH-4234-J	—	165	—		2"
4 000		6								
6 000		9								
8 000		12		15	AFH-4238-J	AFH-4238-JDA	295	360		
10 000		15	3/4		AFH-42310-J	AFH-42310-JDA	300	365		
15 000		22.5	1	24	AFH-42315-J	AFH-42315-JDA	305	380		
20 000		30			AFH-42325-J	AFH-42325-JDA	355	430	1-1/2"	3"
25 000		37.5	1-1/2	36	AFH-42330-J	AFH-42330-JDA	360	440		
30 000		45		50	AFH-42340-J	AFH-42340-JDA	425	510		
40 000		60	2		AFH-42350-J	AFH-42350-JDA	435	525		
50 000		75	3							
2 000	40	3	1	6	AFH-4244-J	—	170	—	1-1/2"	2"
4 000		6								
6 000		9		15	AFH-42410-J	AFH-42410-JDA	295	360		
8 000		12								
10 000		15	1-1/2	24	AFH-42415-J	AFH-42415-JDA	310	390		
15 000		22.5			AFH-42425-J	AFH-42425-JDA	360	440		
20 000		30	2	36	AFH-42430-J	AFH-42430-JDA	365	450	1-1/2"	3"
25 000		37.5		50	AFH-42440-J	AFH-42440-JDA	425	510		
30 000		45	3		AFH-42450-J	AFH-42450-JDA	435	525		
40 000		60								
50 000		75	5	50						
2 000	50	3	2	6	AFH-4254-J	—	175	—		2"
4 000		6								
6 000		9		15	AFH-42510-J	AFH-42510-JDA	315	395		
8 000		12								
10 000		15	3	24	AFH-42515-J	AFH-42515-JDA	330	415		
15 000		22.5								
20 000		30	5	36	AFH-42530-J	AFH-42530-JDA	370	460	1-1/2"	3"
25 000		37.5								
30 000		45	5	50	AFH-42540-S	AFH-42540-SDA	445	535		
40 000		60			AFH-42550-S	AFH-42550-SDA				
50 000		75								

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.
Pumps rated to 200°F maximum condensate temperature.
Models with higher capacities or discharge pressures available upon request.
Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.
Pumps have cast iron bodies.



Armstrong® Stainless Steel Receiver Electric Pump Packages

Condensate
Recovery
Equipment

AFH-4300 Series Stainless Steel Electric Condensate Pump Packages											
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size Inches	Inlet Size Inches	
8 000	20	12	1/3	8	AFH-4028-GS	—	90	—	3/4"	2"	
2 000		3		15	AFH-4328-G	AFH-4328-GDA	125	185			
4 000		6									
6 000		9									
8 000		12									
10 000		15	1/2	30	AFH-43215-G	AFH-43215-GDA	190	240			
15 000		22.5			AFH-43220-G	AFH-43220-GDA	200	250			
20 000		30	3/4	45	AFH-43225-J	AFH-43225-JDA	285	350		2-1/2"	
25 000		37.5			AFH-43230-J	AFH-43230-JDA					
30 000		45	1	60	AFH-43240-J	AFH-43240-JDA	335	405	1-1/2"		
40 000	60	1-1/2	60	AFH-43250-J	AFH-43250-JDA	385	460				
50 000	75	2	95	AFH-4338-J	AFH-4338-JDA	180	250	2"			
2 000	3	1/2	15	AFH-43310-J	AFH-43310-JDA	185	255				
4 000	6										
6 000	9										
8 000	12										
10 000	15										
15 000	22.5	1	30	AFH-43320-J	AFH-43320-JDA	230	300		2-1/2"		
20 000	30			AFH-43325-J	AFH-43325-JDA	285	350				
25 000	37.5	1-1/2	45	AFH-43330-J	AFH-43330-JDA	290	355				
30 000	45			AFH-43340-J	AFH-43340-JDA	340	410				
40 000	60	2	60	AFH-43350-J	AFH-43350-JDA	395	470	1-1/2"			
50 000	75	3	95	AFH-43410-J	AFH-43410-JDA	190	270				
2 000	3	1	15	AFH-43420-J	AFH-43420-JDA	240	310			2"	
4 000	6										
6 000	9										
8 000	12										
10 000	15										
15 000	22.5	1-1/2	30	AFH-43425-J	AFH-43425-JDA	290	355				2-1/2"
20 000	30			AFH-43430-J	AFH-43430-JDA	295	360				
25 000	37.5	2	45	AFH-43440-J	AFH-43440-JDA	340	410				
30 000	45			AFH-43450-J	AFH-43450-JDA	395	470				
40 000	60	3	60	AFH-43510-J	AFH-43510-JDA	195	275	2"			
50 000	75		95	AFH-43515-J	AFH-43515-JDA	245	320				
2 000	3	2	15	AFH-43520-J	AFH-43520-JDA	255	330		2-1/2"		
4 000	6										
6 000	9										
8 000	12										
10 000	15										
15 000	22.5	3	30	AFH-43530-J	AFH-43530-JDA	305	385				
20 000	30			AFH-43540-S	AFH-43540-SDA	370	500				
25 000	37.5	5	45	AFH-43550-S	AFH-43550-SDA	430	560				
30 000	45										

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.

Pumps rated to 200°F maximum condensate temperature.

Models with higher capacities or discharge pressures available upon request.

Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.

Pumps have cast iron bodies.

Steel Receiver Electric Pump Packages - 210°F / 212°F



AFH-4600 Series Steel Electric Condensate Pump Packages																						
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size Inches	Inlet Size Inches												
8 000	20	12	1/2	8	AFH-4028-K	—	90	—	1-1/2"	2"												
2 000	20	3		15	AFH-4628-K	AFH-4628-KDA	125	185	1-1/2"													
4 000		6																				
6 000		9																				
8 000		12																				
10 000		15																				
15 000		22.5									30	AFH-46215-K	AFH-46215-KDA	190	240	2-1/2"						
20 000	30	AFH-46220-K	AFH-46220-KDA	200	250																	
25 000	37.5	3/4	45	AFH-46225-K	AFH-46225-KDA	285	350	1-1/2"	2-1/2"													
30 000	45	1		AFH-46230-K	AFH-46230-KDA																	
40 000	60	1-1/2	60	AFH-46240-K	AFH-46240-KDA	335	405															
50 000	75		95	AFH-46250-K	AFH-46250-KDA	385	460															
2 000	30	3	3/4	15	AFH-4638-K	AFH-4638-KDA	180	250	1-1/2"	2"												
4 000		6																				
6 000		9																				
8 000		12																				
10 000		15									1	30	AFH-46310-K	AFH-46310-KDA	185	255						
15 000		22.5	AFH-46320-K	AFH-46320-KDA	230	300																
20 000		30	1-1/2	45	AFH-46330-K	AFH-46330-KDA	285	350		2-1/2"												
25 000		45					290	355														
30 000		60					340	410														
40 000		75	2	60	AFH-46340-K	AFH-46340-KDA	340	410														
50 000			95	AFH-46350-K	AFH-46350-KDA	395	470															
2 000	40	3	1	15	AFH-4644-K	AFH-4644-KDA	190	270	1-1/2"	2"												
4 000		6			AFH-46410-K	AFH-46410-KDA																
6 000		9	1-1/2								30	AFH-46420-K	AFH-46420-KDA	240	310							
8 000		12																				
10 000		15																				
15 000		22.5	2	45			AFH-46430-K	AFH-46430-KDA		290	355	2-1/2"										
20 000		30			295	360																
25 000		37.5			340	410																
30 000		45	3	60	AFH-46440-K	AFH-46440-KDA	340	410														
40 000		60								95	AFH-46450-K	AFH-46450-KDA	395	470								
50 000		75																				
2 000	50	3	1-1/2	15	AFH-4658-K	AFH-4658-KDA	195	275	1-1/2"	2"												
4 000		6									AFH-46510-K	AFH-46510-KDA										
6 000		9											2	30	AFH-46515-K	AFH-46515-KDA	245	320				
8 000		12																	AFH-46520-K	AFH-46520- KDA	255	330
10 000		15																				
15 000		22.5	3	45	AFH-46527-K	AFH-46527-KDA	305	385		2-1/2"												
20 000		30																				
25 000		37.5																				
30 000		40																				
27 000																						

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.
Pumps rated to 210°F-212°F maximum condensate temperature.
Models with higher capacities or discharge pressures available upon request.
Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.
Pumps have cast iron bodies.

Condensate
Recovery
Equipment



Cast Iron Receiver Electric Pump Packages - 210°F / 212°F

Condensate
Recovery
Equipment

AFH-4700 Series Cast Iron Electric Condensate Pump Packages										
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size Inches	Inlet Size Inches
2 000	20	3	1/2	6	AFH-4724-K	—	150	—	1-1/2"	2"
4 000		6								
6 000		9								
8 000		12			AFH-47210-K	AFH-47210-KDA	260	295		
10 000		15								
15 000		22.5	3/4	24	AFH-47215-K	AFH-47215-KDA	300	445	1-1/2"	3"
20 000		30			AFH-47225-K	AFH-47225-KDA	350	420		
25 000		37.5								
30 000		45			AFH-47230-K	AFH-47230-KDA	355	430		
40 000		60								
50 000		75	1-1/2	50	AFH-47250-K	AFH-47250-KDA	425	510		
2 000	30	3	3/4	6	AFH-4734-K	—	165	—	1-1/2"	2"
4 000		6								
6 000		9								
8 000		12			AFH-4738-K	AFH-4738-KDA	295	360		
10 000		15			AFH-47310-K	AFH-47310-KDA	300	365		
15 000		22.5	1	24	AFH-47315-K	AFH-47315-KDA	305	380	1-1/2"	3"
20 000		30			AFH-47320-K	AFH-47320-KDA	355	430		
25 000		37.5								
30 000		45			AFH-47330-K	AFH-47330-KDA	360	440		
40 000		60								
50 000		75	2	50	AFH-47350-K	AFH-47350-KDA	435	525		
2 000	40	3	1	6	AFH-4744-K	—	170	—	1-1/2"	2"
4 000		6								
6 000		9								
8 000		12			AFH-47410-K	AFH-47410-KDA	295	360		
10 000		15								
15 000		22.5	1-1/2	24	AFH-47415-K	AFH-47415-KDA	310	390	1-1/2"	3"
20 000		30			AFH-47420-K	AFH-47420-KDA	360	440		
25 000		37.5								
30 000		45			AFH-47430-K	AFH-47430-KDA	365	450		
40 000		60								
50 000		75	3	50	AFH-47450-K	AFH-47450-KDA	435	525		
2 000	50	3	1-1/2	6	AFH-4754-K	—	175	—	1-1/2"	2"
4 000		6								
6 000		9								
8 000		12			AFH-4758-K	AFH-4758-KDA	315	395		
10 000		15			AFH-47510-K	AFH-47510-KDA				
15 000		22.5	2	24	AFH-47515-K	AFH-47515-KDA	330	415	1-1/2"	3"
20 000		30								
25 000		37.5								
27 000		40			AFH-47527-K	AFH-46527-KDA	370	460		

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.

Pumps rated to 210°F-212°F maximum condensate temperature.

Models with higher capacities or discharge pressures available upon request.

Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.

Pumps have cast iron bodies.

Stainless Steel Receiver Electric Pump Packages - 210°F / 212°F



AFH-4800 Series Stainless Steel Electric Condensate Pump Packages													
Cap Sq. Ft. EDR	Discharge Pressure PSIG	Pump Cap. G.P.M.	HP 3500 R.P.M.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex	Disch. Size Inches	Inlet Size Inches			
8 000	20	12	1/2	8	AFH-4028-KS	—	90	—	1-1/2"	2"			
2 000		3		15	AFH-4828-K	AFH-4828-KDA	125	185	1-1/2"				
4 000		6											
6 000		9											
8 000		12											
10 000		15											
15 000		22.5	3/4	30	AFH-48215-K	AFH-48215-KDA	190	240	2-1/2"				
20 000		30			AFH-48220-K	AFH-48220-KDA	200	250					
25 000		37.5		45	AFH-48225-K	AFH-48225-KDA	285	350	1-1/2"	2-1/2"			
30 000		45			AFH-48230-K	AFH-48230-KDA							
40 000		60		60	AFH-48240-K	AFH-48240-KDA	335	405					
50 000		75		95	AFH-48250-K	AFH-48250-KDA	385	460					
2 000	30	3	3/4	15	AFH-4838-K	AFH-4838-KDA	180	250	1-1/2"	2"			
4 000		6											
6 000		9											
8 000		12											
10 000		15	1	30	AFH-48310-K	AFH-48310-KDA	185	255		2-1/2"			
15 000		22.5			AFH-48320-K	AFH-48320-KDA	230	300					
20 000		30			AFH-48330-K	AFH-48330-KDA	285	350					
25 000		37.5					290	355					
30 000		45	1-1/2	45	AFH-48340-K	AFH-48340-KDA	340	410					
40 000		60					395	470					
50 000		75	2	95	AFH-48350-K	AFH-48350-KDA	395	470					
2 000		40	3	1	15	AFH-4844-K	AFH-4844-KDA	190	270	1-1/2"	2"		
4 000	6		AFH-48410-K			AFH-48410-KDA							
6 000	9												
8 000	12												
10 000	15		1-1/2	30	AFH-48420-K	AFH-48420-KDA	240	310	2-1/2"				
15 000	22.5												
20 000	30												
25 000	37.5												
30 000	45		2	45	AFH-48430-K	AFH-48430-KDA	290	355					
40 000	60						295	360					
50 000	75		3	60	AFH-48440-K	AFH-48440-KDA	340	410					
				95	AFH-48450-K	AFH-48450-KDA	395	470					
2 000	50	3	1-1/2	15	AFH-4858-K	AFH-4858-KDA	195	275	1-1/2"	2"			
4 000		6											
6 000		9											
8 000		12											
10 000		15	2	30	AFH-48510-K	AFH-48510-KDA	245	320		2-1/2"			
15 000		22.5			AFH-48515-K	AFH-48515-KDA	255	330					
20 000		30			AFH-48520-K	AFH-48520-KDA	305	385					
25 000		37.5											
27 000		40	3	45	AFH-48527-K	AFH-48527-KDA	305	385					

Note: When ordering units, specify sq. ft. capacity, discharge pressure, G.P.M. model number and motor voltage. Higher G.P.M. and discharge pressure available upon request.
Pumps rated to 210°F-212°F maximum condensate temperature.
Models with higher capacities or discharge pressures available upon request.
Contact Armstrong or your local Armstrong representative for submittal drawings and specifications.
Pumps have cast iron bodies.



Sizing for Boiler Feed Package

This sheet **MUST** be sent in with every order.

Date: _____ Representative: _____

Salesperson: _____ Application: _____

Customer: _____ Customer Location: _____

Number of boilers the pump is feeding _____ (need a minimum of one dedicated pump per boiler)

Capacity of each boiler (BHP): _____

BTU/HR / 33 475 = BHP

GPM / 0.069 = BHP

LBS/HR / 34.5 = BHP

Determine pump discharge: _____

Operating pressure of boiler

Friction loss of pipe between pump and boiler (psig)

Lift from pump to boiler (psig) _____ (2.31' lift = 1 psig)

Add 5 psig safety factor _____

Total (psig) _____

Standard packages rated to pump up to 200°F condensate

Temperature of condensate _____

Motor voltage and phase _____

Material of receiver: ☐ Steel ☐ Cast Iron ☐ Stainless Steel

Motor enclosure: ☐ ODP ☐ TEFC*

Is a control panel needed: ☐ Yes ☐ No

NEMA rating: ☐ NEMA 12 ☐ NEMA 4*

Is there a need for pre-heat tube to heat the feed water in the tank? ☐ Yes ☐ No

If so, up to what temperature? _____

What is the maximum inlet pressure of the make-up water to the tank? _____

Need to use a solenoid make-up water valve if over 45 psig.

Boiler Feed Schedule

Model Number _____

Capacity _____ GPM at _____ PSIG

_____ HP _____ RPM

Receiver _____ gallons

Current _____ phase, 60 cycles, _____ volts

Options included on package: _____

Carbon Steel Receiver Boiler Feed Packages

AFH-4100 Series Steel Boiler Feed Packages								
Boiler H.P.	Discharge Pressure PSIG	Pump Cap. G.P.M.	Motor H.P.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex
30	20	6	1/3	30	AFH-4124-GF	AFH-4124-GDF	200	240
	30		1/2		AFH-4134-JF	AFH-4134-JDF	260	300
	40		1		AFH-4144-JF	AFH-4144-JDF	265	310
	50		2		AFH-4154-JF	AFH-4154-JDF	275	330
45	20	9	1/3	45	AFH-4126-GF	AFH-4126-GDF	240	280
	30		1/2		AFH-4136-JF	AFH-4136-JDF	300	340
	40		1		AFH-4146-JF	AFH-4146-JDF	305	350
	50		2		AFH-4156-JF	AFH-4156-JDF	315	370
60	20	12	1/3	60	AFH-4128-GF	AFH-4128-GDF	275	335
	30		1/2		AFH-4138-JF	AFH-4138-JDF	335	395
	40		1		AFH-4148-JF	AFH-4148-JDF	340	405
	50		2		AFH-4158-JF	AFH-4158-JDF	350	425
75	30	15	3/4	95	AFH-41310-JF	AFH-41310-JDF	420	480
	40		1		AFH-41410-JF	AFH-41410-JDF	425	490
100	20	20	1/2	95	AFH-41215-GF	AFH-41215-GDF	360	420
	30		1		AFH-41315-JF	AFH-41315-JDF	420	480
	40		1-1/2		AFH-41415-JF	AFH-41415-JDF	425	490
	50		2		AFH-41515-JF	AFH-41515-JDF	435	510
150	20	30	3/4	120	AFH-41220-GF	AFH-41220-GDF	415	475
	30		1		AFH-41320-JF	AFH-41320-JDF	475	535
	40		1-1/2		AFH-41420-JF	AFH-41420-JDF	480	545
	50		3		AFH-41520-JF	AFH-41520-JDF	490	565

Note: All boiler feed units supplied with Armstrong make-up water valve (rated to 45 psig maximum inlet pressure) and gauge glass; solenoid make-up valve available.

Models with higher capacities or discharge pressures available upon request.

Pumps have cast iron bodies.

Condensate
Recovery
Equipment



Armstrong® Cast Iron Receiver Boiler Feed Packages

Condensate
Recovery
Equipment

AFH-4200 Series Cast Iron Boiler Feed Packages

Boiler H.P.	Discharge Pressure PSIG	Pump Cap. G.P.M.	Motor H.P.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex
30	20	6	1/3	36	AFH-4224-GF	AFH-4224-GDF	465	500
	30		1/2		AFH-4234-JF	AFH-4234-JDF	505	580
	40		1		AFH-4244-JF	AFH-4244-JDF	510	590
	50		2		AFH-4254-JF	AFH-4254-JDF	520	600
60	20	12	1/3	50	AFH-4228-GF	AFH-4228-GDF	575	610
	30		1/2		AFH-4238-JF	AFH-4238-JDF	615	690
	40		1		AFH-4248-JF	AFH-4248-JDF	620	700
	50		2		AFH-4258-JF	AFH-4258-JDF	625	710
75	20	15	1/2	75	AFH-42210-GF	AFH-42210-GDF	785	820
	30		3/4		AFH-42310-JF	AFH-42310-JDF	825	900
	40		1		AFH-42410-JF	AFH-42410-JDF	830	910
	50		2		AFH-42510-JF	AFH-42510-JDF	835	920
100	20	20	1/2	120	AFH-42215-GF	AFH-42215-GDF	1 043	1 078
	50		2		AFH-42515-JF	AFH-42515-JDF	1 100	1 200
150	20	30	3/4	120	AFH-42220-GF	AFH-42220-GDF	1 043	1 078
	30		1		AFH-42320-JF	AFH-42320-JDF	1 085	1 160
	40		1-1/2		AFH-42420-JF	AFH-42420-JDF	1 095	1 180
	50		3		AFH-42520-JF	AFH-42520-JDF	1 110	1 220

Note: All boiler feed units supplied with Armstrong make-up water valve (rated to 45 psig maximum inlet pressure) and gauge glass; solenoid make-up valve available.

Models with higher capacities or discharge pressures available upon request.

Pumps have cast iron bodies.

Stainless Steel Receiver Boiler Feed Packages

AFH-4300 Series Stainless Steel Receiver Boiler Feed Packages								
Boiler H.P.	Discharge Pressure PSIG	Pump Cap. G.P.M.	Motor H.P.	Rec. Cap Gal.	Unit Model No. Simplex	Unit Model No. Duplex	Weight (lb) Simplex	Weight (lb) Duplex
30	20	6	1/3	30	AFH-4324-GF	AFH-4324-GDF	200	240
	30		1/2		AFH-4334-JF	AFH-4334-JDF	260	300
	40		1		AFH-4344-JF	AFH-4344-JDF	265	310
	50		2		AFH-4354-JF	AFH-4354-JDF	275	330
45	20	9	1/3	45	AFH-4326-GF	AFH-4326-GDF	240	280
	30		1/2		AFH-4336-JF	AFH-4336-JDF	300	340
	40		1		AFH-4346-JF	AFH-4346-JDF	305	350
	50		2		AFH-4356-JF	AFH-4356-JDF	315	370
60	20	12	1/3	60	AFH-4328-GF	AFH-4328-GDF	275	335
	30		1/2		AFH-4338-JF	AFH-4338-JDF	335	395
	40		1		AFH-4348-JF	AFH-4348-JDF	340	405
	50		2		AFH-4358-JF	AFH-4358-JDF	350	425
75	30	15	3/4	95	AFH-43310-JF	AFH-43310-JDF	420	480
	40		1		AFH-43410-JF	AFH-43410-JDF	425	490
100	20	20	1/2	95	AFH-43215-GF	AFH-43215-GDF	360	420
	30		1		AFH-43315-JF	AFH-43315-JDF	420	480
	40		1-1/2		AFH-43415-JF	AFH-43415-JDF	425	490
	50		2		AFH-43515-JF	AFH-43515-JDF	435	510
150	20	30	3/4	120	AFH-43220-GF	AFH-43220-GDF	415	475
	30		1		AFH-43320-JF	AFH-43320-JDF	475	535
	40		1-1/2		AFH-43420-JF	AFH-43420-JDF	480	545
	50		3		AFH-43520-JF	AFH-43520-JDF	490	565

Note: All boiler feed units supplied with Armstrong make-up water valve (rated to 45 psig maximum inlet pressure) and gauge glass; solenoid make-up valve available.

Models with higher capacities or discharge pressures available upon request.

Pumps have cast iron bodies.

Condensate
Recovery
Equipment



AFH 4400 Series Stainless Steel Condensate Return Units

High Quality Stainless Steel Exceptional Value, Extraordinary Quality

Armstrong Stainless Steel Condensate Return Units offer the best materials available for long life. Tanks have a 20-year warranty against failure due to corrosion and are made from 304 SS with internal ribbing where needed for excellent strength. Available in six standard sizes; 12, 25, 45, 70, and 100 gallon capacities (with custom sizes available) in simplex or duplex pump configuration. Compact dimensions and light weight make it a simple task to replace your old cast iron unit. System accessories are of the highest quality.

These pumps are made of investment cast 316 stainless steel. The single stage impeller is of semi-open design allowing for occasional pumping of small solids without clogging. Pump is permanently aligned to the electric motor, never requiring alignment at the job site. Pumps are furnished with 250°F mechanical seals, and are equipped with a seal cavity bleed line to keep the seal lubricated and minimize the probability of premature seal failure. Pump discharge openings are NPT.

Standard motors are: three phase- 208/230/460 V TEFC, Single phase -115/208/230 V ODP. Other voltages are available on request. Other motors available are explosion proof, wash down duty, premium efficiency, and any other motor available with a 56C frame.

Motor/pump controls available for simplex, duplex, triplex, and quadplex, in single phase or three phase with a limitless array of available options for any requirement. NEMA 1 is standard enclosure. All other enclosures are available.



AFH-4400 Series

All Stainless Steel Condensate Pumps (Simplex and Duplex)									
Capacity Sq. Ft. EDR	Discharge Pressure PSI	Pump Capacity G.P.M.	Receiver Capacity Gallons	Three Phase Motor HP 3500 R.P.M.	Three Phase Model Number (Simplex)	Three Phase Model Number (Duplex)	Single Phase Motor HP 3500 R.P.M.	Single Phase Model Number (Simplex)	Single Phase Model Number (Duplex)
6000	15	6	12	1/2	AFH-44S3156	AFH-44D3156	1/3	AFH-44S1156	AFH-44D1156
	20			1/2	AFH-44S3206	AFH-44D3206	1/3	AFH-44S1206	AFH-44D1206
	25			1/2	AFH-44S3256	AFH-44D3256	1/2	AFH-44S1256	AFH-44D1256
	30			3/4	AFH-44S3306	AFH-44D3306	3/4	AFH-44S1306	AFH-44D1306
	40			1-1/2	AFH-44S3406	AFH-44D3406	1-1/2	AFH-44S1406	AFH-44D1406
	50			1-1/2	AFH-44S3506	AFH-44D3506	1-1/2	AFH-44S1506	AFH-44D1506
9000	15	9		1/2	AFH-44S3159	AFH-44D3159	1/3	AFH-44S1159	AFH-44D1159
	20			1/2	AFH-44S3209	AFH-44D3209	1/3	AFH-44S1209	AFH-44D1209
	25			3/4	AFH-44S3259	AFH-44D3259	3/4	AFH-44S1259	AFH-44D1259
	30			3/4	AFH-44S3309	AFH-44D3309	3/4	AFH-44S1309	AFH-44D1309
	40			1-1/2	AFH-44S3409	AFH-44D3409	1-1/2	AFH-44S1409	AFH-44D1409
	50			1-1/2	AFH-44S3509	AFH-44D3509	1-1/2	AFH-44S1509	AFH-44D1509
12000	15	12		1/2	AFH-44S31512	AFH-44D31512	1/3	AFH-44S11512	AFH-44D11512
	20			1/2	AFH-44S32012	AFH-44D32012	1/3	AFH-44S12012	AFH-44D12012
	25			3/4	AFH-44S32512	AFH-44D32512	3/4	AFH-44S12512	AFH-44D12512
	30			3/4	AFH-44S33012	AFH-44D33012	3/4	AFH-44S13012	AFH-44D13012
	40			1-1/2	AFH-44S34012	AFH-44D34012	1-1/2	AFH-44S14012	AFH-44D14012
	50			1-1/2	AFH-44S35012	AFH-44D35012	1-1/2	AFH-44S15012	AFH-44D15012
15000	15	15	25	1/2	AFH-44S31515	AFH-44D31515	1/3	AFH-44S11515	AFH-44D11515
	20			1/2	AFH-44S32015	AFH-44D32015	1/3	AFH-44S12015	AFH-44D12015
	25			1	AFH-44S32515	AFH-44D32515	1	AFH-44S12515	AFH-44D12515
	30			1	AFH-44S33015	AFH-44D33015	1	AFH-44S13015	AFH-44D13015
	40			1-1/2	AFH-44S34015	AFH-44D34015	1-1/2	AFH-44S14015	AFH-44D14015
	50			2	AFH-44S35015	AFH-44D35015	2	AFH-44S15015	AFH-44D15015
22000	15	22.5		1/2	AFH-44S31522	AFH-44D31522	1/2	AFH-44S11522	AFH-44D11522
	20			1/2	AFH-44S32022	AFH-44D32022	1/2	AFH-44S12022	AFH-44D12022
	25			1	AFH-44S32522	AFH-44D32522	1	AFH-44S12522	AFH-44D12522
	30			1	AFH-44S33022	AFH-44D33022	1	AFH-44S13022	AFH-44D13022
	40			1-1/2	AFH-44S34022	AFH-44D34022	1-1/2	AFH-44S14022	AFH-44D14022
	50			3	AFH-44S35022	AFH-44D35022	3	—	—
30000	15	30	45	1/2	AFH-44S21530	AFH-44D31530	1/2	AFH-44S11530	AFH-44D11530
	20			1/2	AFH-44S32030	AFH-44D32030	1/2	AFH-44S12030	AFH-44D12030
	25			1	AFH-44S32530	AFH-44D32530	1	AFH-44S12530	AFH-44D12530
	30			1-1/2	AFH-44S33030	AFH-44D33030	1-1/2	AFH-44S13030	AFH-44D13030
	40			2	AFH-44S34030	AFH-44D34030	2	AFH-44S14030	AFH-44D14030
	50			3	AFH-44S35030	AFH-44D35030	3	—	—
37500	15	37.5		1/2	AFH-44S21537	AFH-44D31537	1/2	AFH-44S11537	AFH-44D11537
	20			3/4	AFH-44S32037	AFH-44D32037	3/4	AFH-44S12037	AFH-44D12037
	25			1-1/2	AFH-44S32537	AFH-44D32537	1-1/2	AFH-44S12537	AFH-44D12537
	30			1-1/2	AFH-44S33037	AFH-44D33037	1-1/2	AFH-44S13037	AFH-44D13037
	40			3	AFH-44S34037	AFH-44D34037	3	—	—
	50			3	AFH-44S35037	AFH-44D35037	3	—	—
45000	15	45	1/2	AFH-44S31545	AFH-44D31545	1/2	AFH-44S11545	AFH-44D11545	
	20		3/4	AFH-44S32045	AFH-44D32045	3/4	AFH-44S12045	AFH-44D12045	
	25		1-1/2	AFH-44S32545	AFH-44D32545	1-1/2	AFH-44S12545	AFH-44D12545	
	30		2	AFH-44S33045	AFH-44D33045	2	AFH-44S13045	AFH-44D13045	
	40		3	AFH-44S34045	AFH-44D34045	3	—	—	
	50		3	AFH-44S35045	AFH-44D35045	3	—	—	

Standard Unit Includes: Stainless Steel tank complete with flange mounted Stainless Steel pump close coupled to TEFC motor of HP shown.

Simplex unit has NEMA 1 Float Switch and Duplex has NEMA 1 Mechanical Alternator. Stainless steel valve sight glass is standard.

Note: Single-Phase units 2 HP and over, and all 3-Phase units require control panel unless customer will supply motor starters.

Additional motor options available: Washdown Duty and explosion proof

Consult Factory for higher temperatures. Consult Factory for 4400 Series Boiler Feed Units.

Pumps rated to 200°F maximum condensate temperature. Motors are not stainless steel.

All Stainless Steel Condensate Pumps (Simplex and Duplex)								
Capacity Sq. Ft. EDR	Discharge Pressure PSI	Pump Capacity G.P.M.	Receiver Capacity Gallons	Three Phase Motor HP 3500 R.P.M.	Three Phase Model Number (Simplex)	Three Phase Model Number (Duplex)	Single Phase Model Number (Simplex)	Single Phase Model Number (Duplex)
60000	15	60	70	3/4	AFH-44S31560	AFH-44D31560	AFH-44S11560	AFH-44D11560
	20			1	AFH-44S32060	AFH-44D32060	AFH-44S12060	AFH-44D12060
	25			2	AFH-44S32560	AFH-44D32560	AFH-44S12560	AFH-44D12560
	30			2	AFH-44S33060	AFH-44D33060	AFH-44S13060	AFH-44D13060
	40			3	AFH-44S34060	AFH-44D34060	—	—
	50			3	AFH-44S35060	AFH-44D35060	—	—
75000	15	75		1	AFH-44S31575	AFH-44D31575	AFH-44S11575	AFH-44D11575
	20			1-1/2	AFH-44S32075	AFH-44D32075	AFH-44S12075	AFH-44D12075
	25			2	AFH-44S32575	AFH-44D32575	AFH-44S12575	AFH-44D12575
	30			3	AFH-44S33075	AFH-44D33075	—	—
	40			3	AFH-44S34075	AFH-44D34075	—	—
	50			5	AFH-44S35075	AFH-44D35075	—	—
90000	15	90	100	1-1/2	AFH-44S31590	AFH-44D31590	AFH-44S11590	AFH-44D11590
	20			2	AFH-44S32090	AFH-44D32090	AFH-44S12090	AFH-44D12090
	25			2	AFH-44S32590	AFH-44D32590	AFH-44S12590	AFH-44D12590
	30			3	AFH-44S33090	AFH-44D33090	—	—
	40			5	AFH-44S34090	AFH-44D34090	—	—
	50			5	AFH-44S35090	AFH-44D35090	—	—
112000	15	112	135	3	AFH-44S315112	AFH-44D315112	—	—
	20			3	AFH-44S320112	AFH-44D320112	—	—
	25			3	AFH-44S325112	AFH-44D325112	—	—
	30			5	AFH-44S330112	AFH-44D330112	—	—
	40			5	AFH-44S340112	AFH-44D340112	—	—
	50			5	AFH-44S350112	AFH-44D350112	—	—
150000	15	150	135	5	AFH-44S315150	AFH-44D315150	—	—
	20			5	AFH-44S320150	AFH-44D320150	—	—
	25			5	AFH-44S325150	AFH-44D325150	—	—
	30			5	AFH-44S330150	AFH-44D330150	—	—
	40			7-1/2	AFH-44S340150	AFH-44D340150	—	—
	50			7-1/2	AFH-44S350150	AFH-44D350150	—	—

Standard Unit Includes: Stainless Steel tank complete with flange mounted Stainless Steel pump close coupled to TEFC motor of HP shown.

Simplex unit has NEMA 1 Float Switch and Duplex has NEMA 1 Mechanical Alternator. Stainless steel valve sight glass is standard.

Note: Single-Phase units 2 HP and over, and all 3-Phase units require control panel unless customer will supply motor starters.

Additional motor options available: Washdown Duty and explosion proof

Consult Factory for higher temperatures. Consult Factory for 4400 Series Boiler Feed Units.

Pumps rated to 200°F maximum condensate temperature. Motors are not stainless steel.

AFH 4400 Series

Stainless Steel Condensate Return Unit Accessories



Sight Gauge Assembly

SS bottom fixture with shut-off valve, SS top fixture, 2- heavy duty SS glass guards, and tempered glass tube.

Stainless Steel Butterfly Isolation Valves (Optional)

Butterfly Isolation Valves between pump and receiver are available. These valves are of great value when removing one pump of a duplex system without having to shut the system down.

Float Switches

Float Switches are heavy duty 2 pole with stainless steel rod and float. Duplex alternating float switch includes high level lag pump on feature.

Nema 1 standard, Nema 4 and Nema 7/9 are available.

Pressure Gauges (Optional) Not Shown

2 1/2" Liquid Filled SS Casing

Thermometer (Optional)

2 1/2" Diameter face, Bi-metal, 4" stem, Range 32 - 250°F.



Features

- Motor circuit protector (MCP)
- HOA selector switch
- External reset
- Control circuit transformer
- Pilot light (pump running)
- Removable mounting plate and thermal strip in a single NEMA 12 enclosure
- Mounted and wired with single-point power connection
- CE
- CSA
- UL listed component

Options

- UL certification
- CUL certification
- Pilot light
- Test push button
- Electric alternator
- Low water cutoff
- Manual transfer switch (boiler feed only)
- High-level alarm horn and light with silencing switch
- Low-level alarm horn and light with silencing switch
- Remote mounting deduction
- Simplex, triplex, quadruplex pumps
- Explosion proof
- NEMA 4, 4X

Special Options

- Mechanical and electrical alternators
- Thermometer
- Isolation valves
- Special motor construction
 - TEFC
 - Explosion proof
- 1750 RPM motors
- Larger pumping capacities
- Higher discharge pressures
- 2' NPSH Rating
- Water level gauge
- Discharge pressure gauges
- Inlet strainer



Control Panel

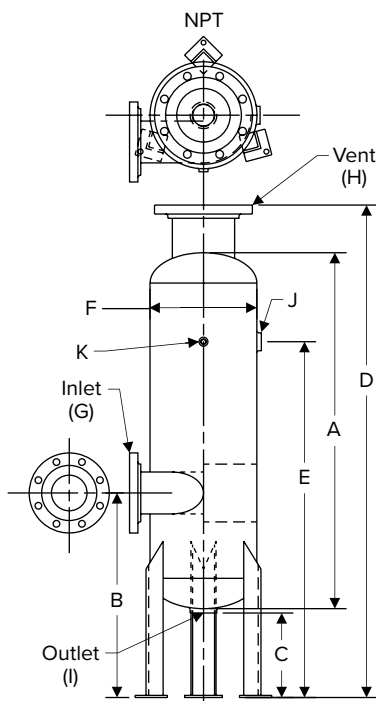


Water Level Gauge
(optional on most models)



Isolation Valve
(optional on most models)

Vertical Flash Tanks (VAFT)



Condensate
Recovery
Equipment

Features

- ASME coded and stamped vessels
- Standard pressure rating 150 psig (other pressure ratings available upon request)
- Standard models are designed and sized to cover a wide range of applications and loads
- Flash vessels are designed to provide low velocity flash steam with no water carryover
- Quick payback for flash recovery investment
- Special tanks available upon request

For a fully detailed certified drawing, refer to CDF #1023.

Flash Steam Savings Analysis

Part I: Determining the amount of flash steam produced

- A. Condensate Load $A = \underline{\hspace{2cm}}$ lb/hr.
- B. Annual hours of operation $B = \underline{\hspace{2cm}}$ hrs/yr.
- C. Steam Cost $C = \underline{\hspace{2cm}}$ \$/1 000 lbs.
- D. Flash steam percentage from chart $D = \underline{\hspace{2cm}}$ %
(on page 264)
- E. Flash steam produced:
 $D \times A = \text{flash steam produced}$ $E = \underline{\hspace{2cm}}$ lb/hr.

Part II: Determining dollar value of the flash steam

- F. Annual flash steam savings:
$$F = \frac{E \times B \times C}{1000}$$
 $F = \underline{\hspace{2cm}}$ \$/yr.

Physical Data—Standard Design Model VAFT

Model No.	AFT-6		AFT-8		AFT-12		AFT-16	
	in	mm	in	mm	in	mm	in	mm
A	36	914	36	914	40	1 016	48	1 219
B	21	533	21	533	23	584	26	660
C	9-1/2	241	9-1/2	241	9-1/2	241	9-1/2	241
D	51	1 295	52	1 321	55-3/8	1 407	63-1/2	1 613
E	36	914	36	914	40	1 016	48	1 219
F	6	150	8	203	12	305	16	406
G	2	50	3	80	4	102	6	150
H	2-1/2	65	4	102	6	150	6	150
I	1-1/2	40	1-1/2	40	2	50	2	50
J	3/4	20	1	25	1-1/2	40	2	50
K	1/2	15	1/2	15	1/2	15	1/2	15

NOTE: Connections "G" and "H" are 150 lb. flanges. All others are NPT. All flash tanks are ASME coded for 150 psig (10 barg). Special sizes available upon request.

Capacities—Standard Design Model VAFT

Model No.	Maximum Condensate Load		Maximum Flash Load	
	lb/hr	kg/hr	lb/hr	kg/hr
AFT-6	2 000	907	325	147
AFT-8	5 000	2 268	900	408
AFT-12	10 000	4 536	2 000	907
AFT-16	20 000	9 072	2 000	907

Features

- ASME coded and stamped vessels
- Standard pressure rating 150 psig (other pressure ratings available upon request)
- Standard models are designed and sized to cover a wide range of applications and loads
- Flash vessels are designed to provide low velocity flash steam with no water carryover
- Quick payback for flash recovery investment
- Special tanks available upon request
- HAFT-Series horizontal flash tanks for low flash load applications.

For a fully detailed certified drawing, refer to CDF #1038.

Flash Steam Savings Analysis

Part I: Determining the amount of flash steam produced

- A. Condensate Load $A = \underline{\hspace{2cm}}$ lb/hr.
- B. Annual hours of operation $B = \underline{\hspace{2cm}}$ hrs/yr.
- C. Steam Cost $C = \underline{\hspace{2cm}}$ \$/1 000 lbs.
- D. Flash steam percentage from chart $D = \underline{\hspace{2cm}}$ %
(on page 264)
- E. Flash steam produced:
 $D \times A = \text{flash steam produced}$ $E = \underline{\hspace{2cm}}$ lb/hr.

Part II: Determining dollar value of the flash steam

- F. Annual flash steam savings:
$$F = \frac{E \times B \times C}{1\,000}$$
 $F = \underline{\hspace{2cm}}$ \$/yr.

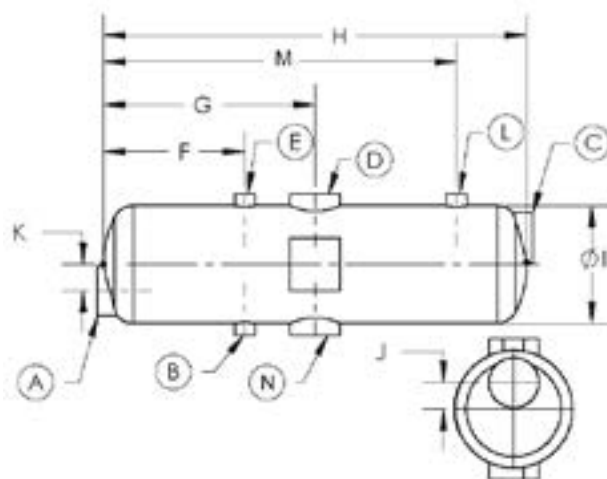
NOTES

1. Models are ASME SEC. VIII "U" stamped for 150 psig
2. All connections are FNPT.

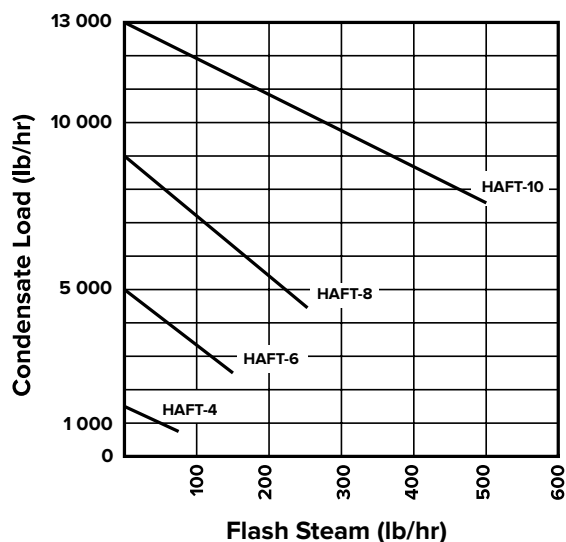
Physical Data — Standard Design Model (HAFT)

Model No.	HAFT-10		HAFT-8		HAFT-6		HAFT-4	
	in	mm	in	mm	in	mm	in	mm
A	3	76	2	50	1-1/2	38	1-1/2	38
B	1	25	1	25	1	25	1	25
C	3	76	2	50	1-1/2	38	1-1/2	38
D	3	76	2-1/2	64	2	50	1-1/2	38
E	1	25	1	25	1	25	1	25
F	12	305	12	305	12	305	8	203
G	18	457	18	457	18	457	12	305
H	36	914	36	914	36	914	24	610
I	10	254	8	203	6	152	4	102
J	2-1/4	57	1-3/4	44	1-1/4	32	1	25
K	2-1/4	57	1-3/4	44	1-1/4	32	1	25
L	1	25	1	25	1	25	1	25
M	30	762	30	762	30	762	18	457
N	3	76	2	50	2	50	1-1/2	38

Note: All flash tanks are ASME coded for 150 psig (10 barg). Special sizes and connections available upon request.



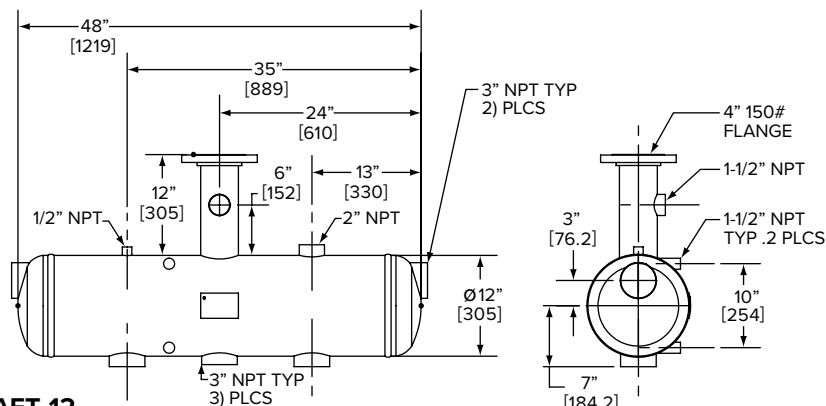
HAFT Series Sizing



Capacities — Standard Design Model (HAFT)

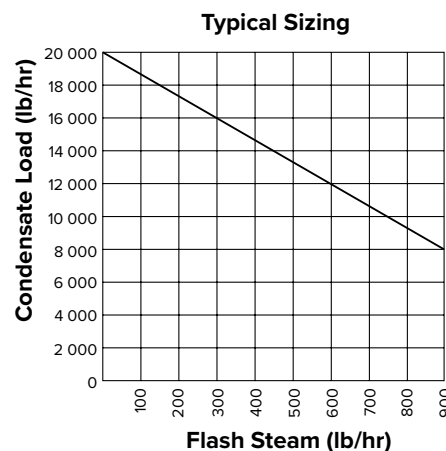
Model No.	Maximum Condensate Load	
	lb/hr	kg/hr
HAFT-10	13 000	5 897
HAFT-8	9 000	4 082
HAFT-6	5 000	2 268
HAFT-4	1 500	680

Horizontal Flash Tanks (HAFT)

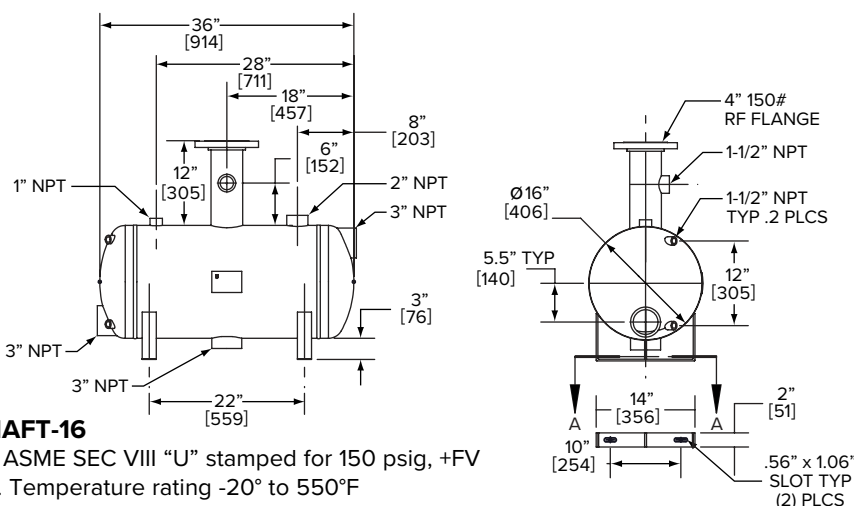


HAFT-12

1. ASME SEC VIII "U" stamped for 150 psig, +FV
2. Temperature rating -20° to 550°F
3. Approximate volume: 22 gallons
4. Maximum flash load 900 lb/hr

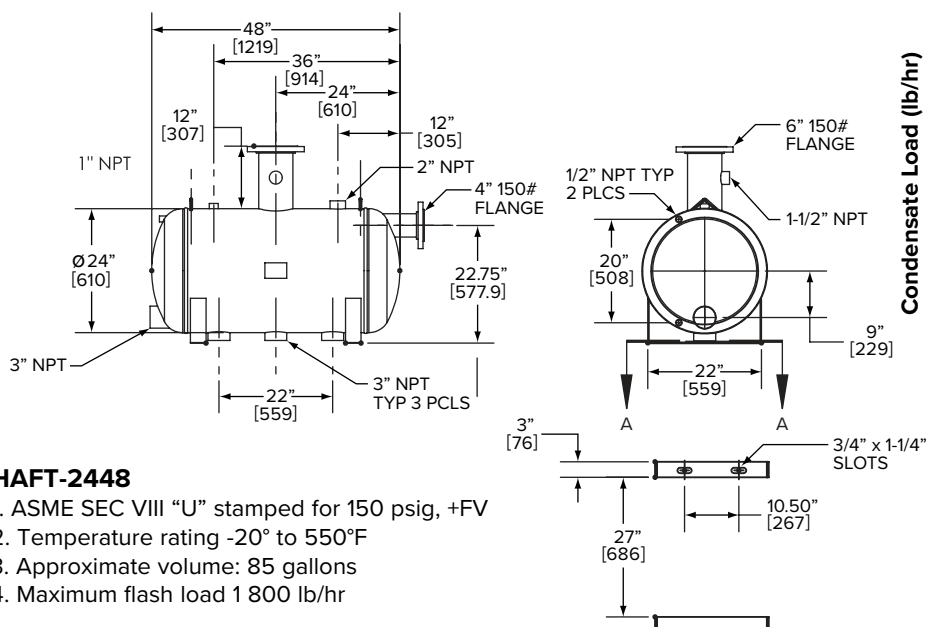
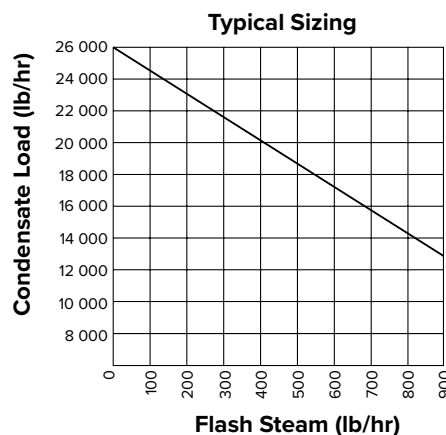


Condensate
Recovery
Equipment



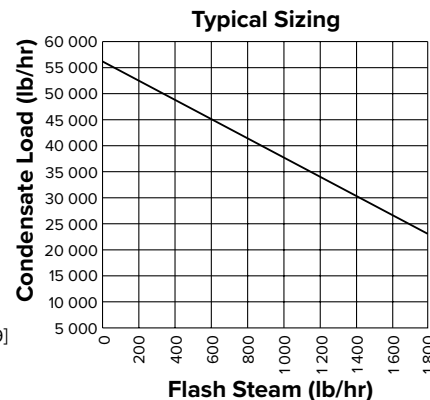
HAFT-16

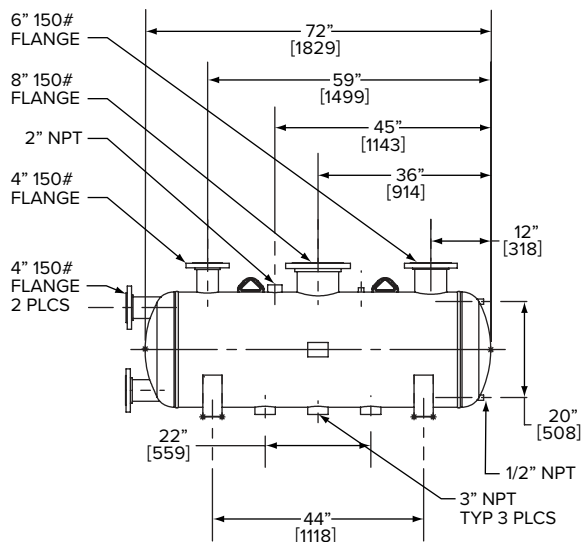
1. ASME SEC VIII "U" stamped for 150 psig, +FV
2. Temperature rating -20° to 550°F
3. Approximate volume: 30 gallons
4. Maximum flash load 900 lb/hr



HAFT-2448

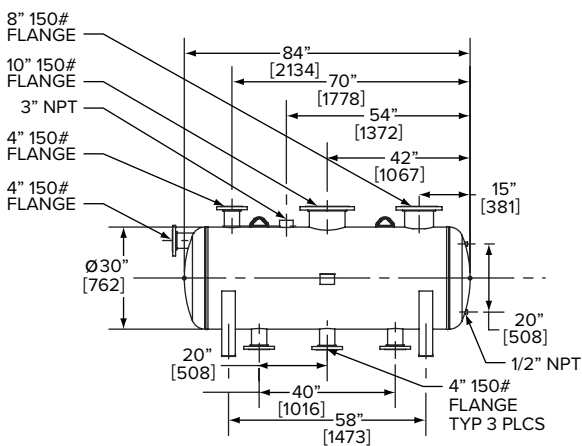
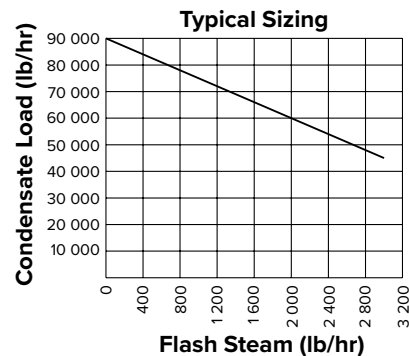
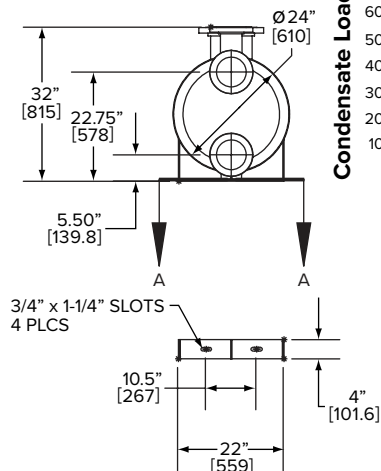
1. ASME SEC VIII "U" stamped for 150 psig, +FV
2. Temperature rating -20° to 550°F
3. Approximate volume: 85 gallons
4. Maximum flash load 1 800 lb/hr





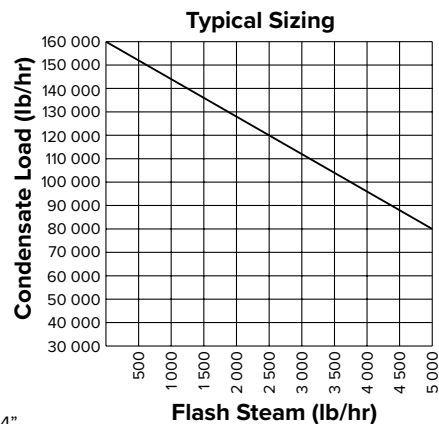
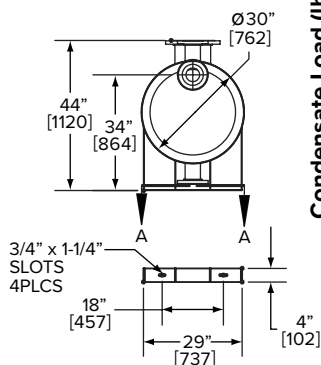
HAFT-2472

1. ASME SEC VIII "U" stamped for 150 psig, +FV
2. Temperature rating -20° to 550°F
3. Approximate volume: 130 gallons
4. Maximum flash load 3 000 lb/hr



HAFT-3084

1. ASME SEC VIII "U" stamped for 150 psig, +FV
2. Temperature rating -20° to 550°F
3. Approximate volume: 240 gallons
4. Maximum flash load 5 000 lb/hr



Flash Recovery Vessels

How much flash steam is available?

1. Follow horizontal axis right to primary discharge pressure.
2. Follow vertically up to secondary pressure curve.
3. Move left to "Percentage of flash steam."

Example:

Condensate load = 10 000 lb/hr

Primary pressure = 100 psig

Secondary pressure = 10 psig

Percentage of flash = 10.6%

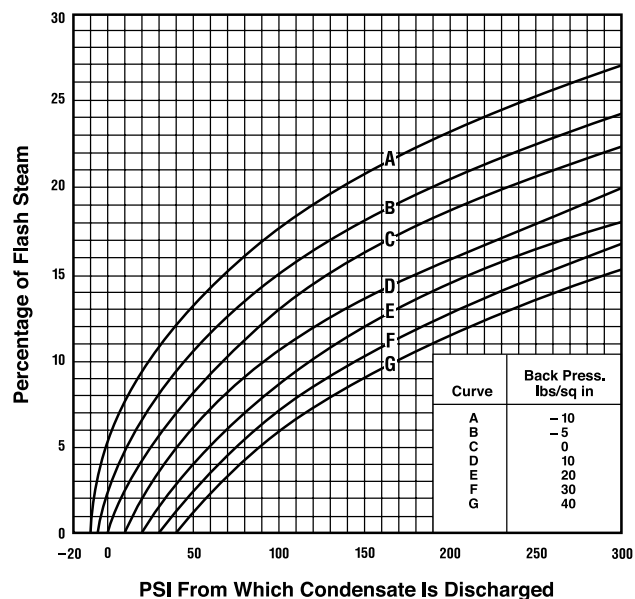
Secondary steam load = 1 060 lb/hr

(10 000 lb/hr x .1060 = 1 060 lb/hr)

Selection:

Model AFT-12

Percentage of Flash Steam Formed When Discharging Condensate to Reduced Pressure



Condensate Recovery Equipment

Application Information

- Condensate Load to Flash Tank **6 000** lb/hr
- Pressure of Incoming Condensate **100** psig
- Flash Tank Pressure **20** psig
- Flash Percentage **9.5%**
- Flash Amount = $A \times (D/100) = 570$ lb/hr
- Low Pressure Steam Required **2 500** lb/hr
- High Pressure Steam **200** psig
- Back Pressure **5** psig

Flash tank will accommodate (A) **6 000** lb/hr of condensate at (B) **100** psig, resulting in (E) **570** lb/hr of flash steam at (C) **20** psig. The flash tank shall be Armstrong Model AFT-12.

The back pressure regulator shall pass (E) **570** lb/hr of steam from (C) **20** psig to atmosphere. The back pressure regulator shall be Armstrong Model **1" GP-2000R**.

The pressure reducing valve shall pass (F) **2 500** lb/hr of steam from (G) **200** psig to (C) **20** psig. Pressure reducing valve shall be **3/4" GP-2000**.

The steam trap shall be an inverted bucket type with large vent and internal check valve. The steam trap will be sized using a 3:1 safety factor. The steam trap shall pass $3 \times (A - E)$ **16 290** lb/hr at a (C - H) **15** psig differential. The steam trap shall be an Armstrong Model **2" 816 CV**.

