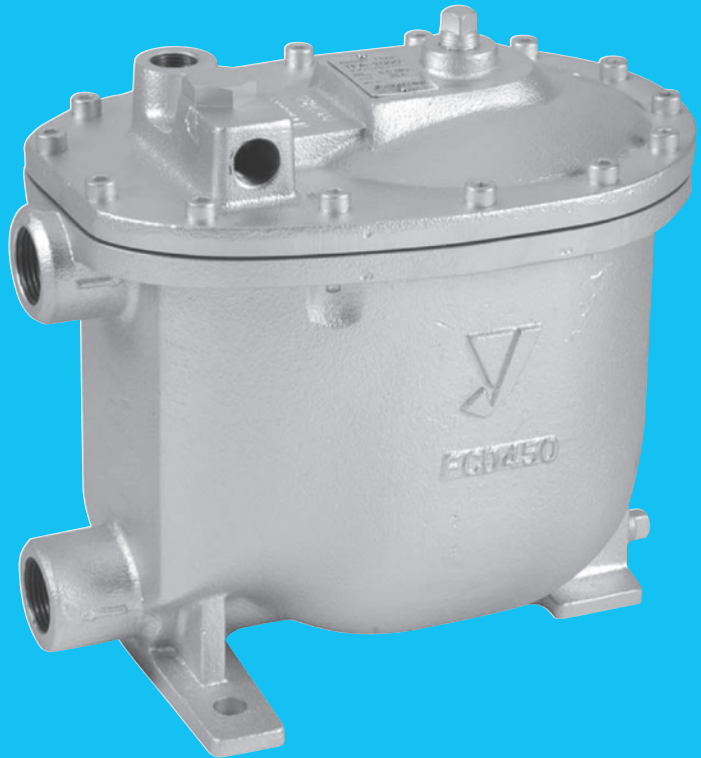


Assist Trap Pumping Trap

6



Step 0 Type/Structure/Features

Please refer to this for structure and features of Assist Trap and Pumping Trap.

Step 1 Selection

Please look at the ID chart to choose the right products depending on the intended of uses. Confirm the additional details on the product page.

Step 2 Sizing

Please confirm flow rate capacity table on the product page.

Step 3 Attentions for usage

Please check some guidelines for optimal usage of the products such as installation.

Selection of Assist Trap and Pumping Trap

What is PUMPING TRAP...?

It is mechanical pump utilizing steam pressure or air pressure as driving force, and compresses and discharges condensate mechanically. No electrical equipment required, free from care for cavitation due to suction by electrical pump.

Please use
mainly in the
open system.



PF-7000



PF-2000

What is ASSIST TRAP...?

It is condensate discharging device - float type steam trap equipped with assist function by driving pressure (pumping trap function).

Please use
mainly in
closed system.



TFA-2000

Intended purpose is as follows:

Condensate
recovery for
implementation
of energy saving

Condensate
accumulation
prevention for
heat exchanger
*Corrosion prevention
*Water hammer prevention
*Uneven heating prevention

Water hammer
prevention for
condensate
recovery pipe

High efficiency
of steam using
devices

If you conduct condensate recovery by just connecting pipes, pressure difference is not enough by influence of recovered back pressure, then capacity of steam trap become insufficient or water hammer occurs at recovery pipe by flash steam. TFA-2000 assist trap and PF series pumping trap makes condensate recovery and condensate accumulation prevention without water hammer, without influencing existing production efficiency.

Application on Purposes

Step
0

Open system

Open system discharges condensate from steam trap of steam devices to atmospheric open type open receiver tank, and separates flash steam and condensate, and pumping only condensate by pumping trap.

■ Intended purpose is as follows:

• Condensate recovery

Condensate recovery at low pressure steam line (it is impossible to recover under normal condition) become possible.

• Measure against water hammer

In case that condensate accumulates at recovery pipe inevitably due to layout of condensate recovery pipe, water hammer may occur by flash steam or live steam from steam trap.

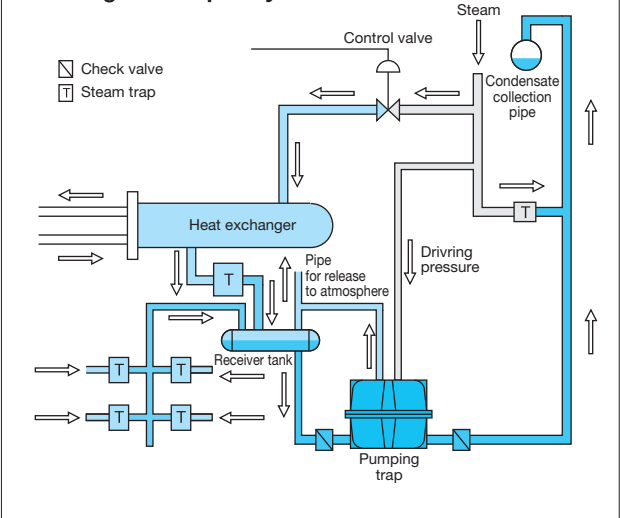
Open receiver system of pumping trap can be a measure against water hammer at recovery pipe because it separates steam such as flash steam and condensate and discharges only condensate.

• Improvement of production efficiency in temperature, time and etc.

In some cases a device works smoothly when condensate recovery is not conducted, but when condensate recovery is conducted, temperature become instable or it takes more time in relation to conventional process. This is because discharge amount shortage is caused since pressure of recovery pipe operates as back pressure against steam trap, and effective pressure difference which determines discharge amount is reduced.

Open receiver system of pumping trap can recover initial temperature stability and time efficiency because it makes atmospheric air discharge almost same as this at the time that condensate recovery is not conducted.

Flow diagram of open system



Closed system

Closed system attaches steam device to pumping trap directly (without involving steam trap) and discharges condensate.

* According to usage condition, steam trap is installed at outlet side of pumping trap.

■ Intended purpose is as follows:

• Measure against condensate accumulation of steam device

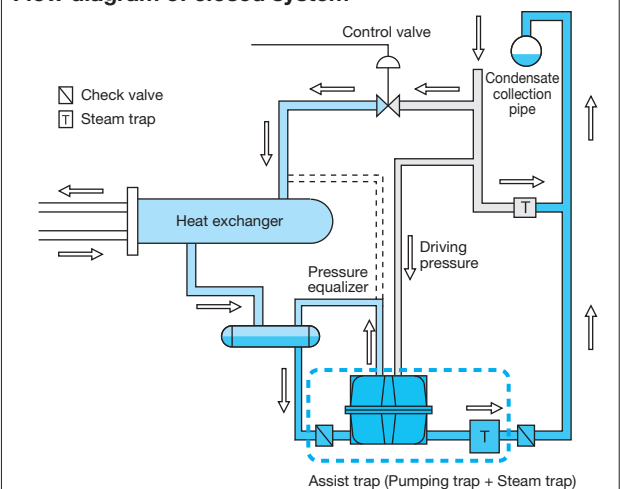
Assist trap, (pumping trap + steam trap)

Regarding steam device such as heat exchanger or air heater, on system which controls steam according to load fluctuation, there are some cases that condensate accumulates inside devices when steam pressure is lowered or becomes negative pressure.

This condensate accumulation may makes temperature unstable, or corrosion and water hammer may damage devices.

Since closed system of pumping trap can discharge condensate under any conditions, it can make steam devices works fully and prevent trouble by corrosion or water hammer.

Flow diagram of closed system



• When discharge pressure is enough, steam trap discharges condensate. When discharge amount of steam trap is not enough by temperature control, assist trap and pumping trap put condensate inside, and the float rise up and the valve for driving pressure is opened, then steam is introduced into inside of the traps and condensate is discharged.

Features of Assist Trap <TFA-2000>

Vent port

For connection of pressure equalizer

Strainer for driving pressure inlet

Screen can be cleaned from outside.

Condensate inlet

Check valve (swing type) for inlet side is built-in.

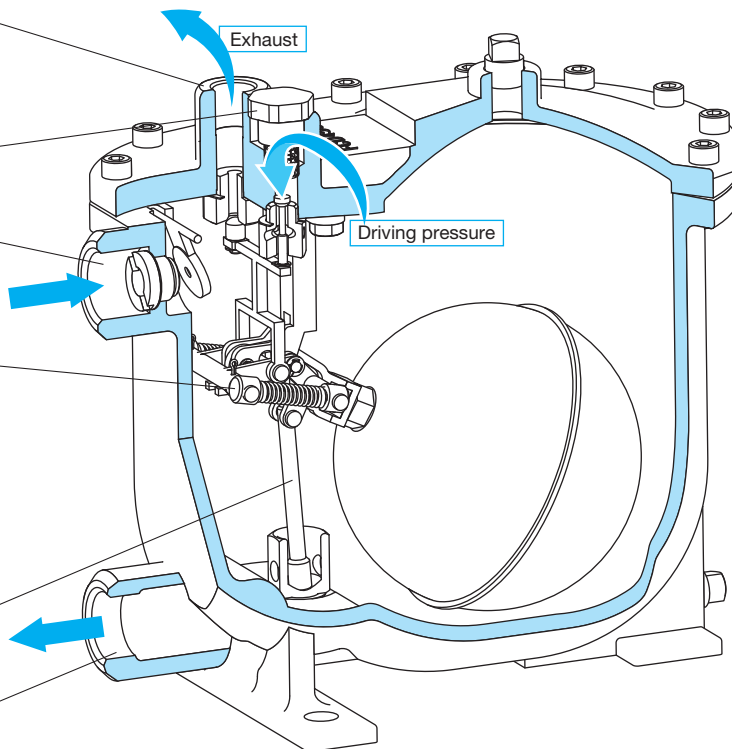
Stainless steel internal parts

Very simple working by spring.
<No regulation is needed>
Main parts are attached to cover.
Main parts can be replaced without removing the product from condensate inlet - outlet piping.

Steam trap function

Condensate outlet

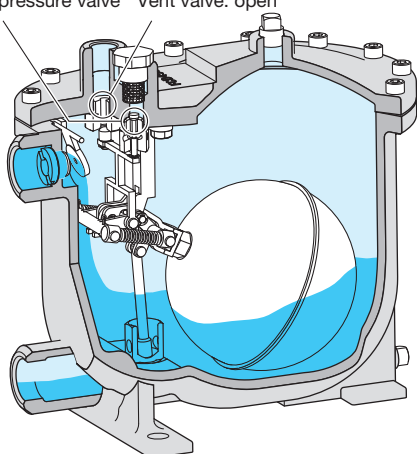
Check valve for outlet side is attached externally.



Operating Principle

• Trap Operation

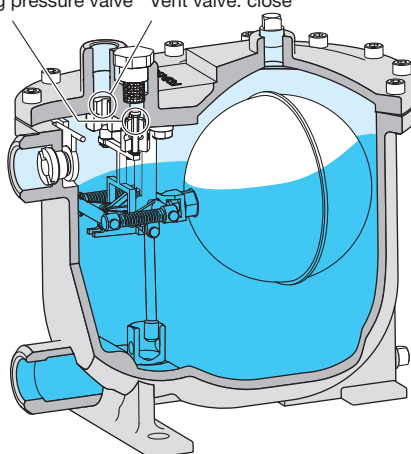
Driving pressure valve : close Vent valve: open



Works as float steam trap since condensate has pressure and can be discharged by its own pressure.

• Assist operation

Driving pressure valve : open Vent valve: close



When condensate has no pressure and cannot be discharged, and condensate is accumulated and the float rises to a certain level in the assist trap, then mechanism is switched and drive steam flows in, this trap compresses and discharges the accumulated condensate in a coercive manner.

Features of Pumping Trap <PF-2000/PF-7000>

Step
0

Stainless steel internal parts

Mechanism frame is made of lost-wax stainless steel.
The other internal parts are also stainless steel.

Spring is Inconel

Inconel X-750 spring is adopted
Much higher reliability is accomplished compared to conventional spring.

Lightweight

For body, ductile cast iron with superior pressure resistance is used.
Adopting spherical shape, downsizing is accomplished.

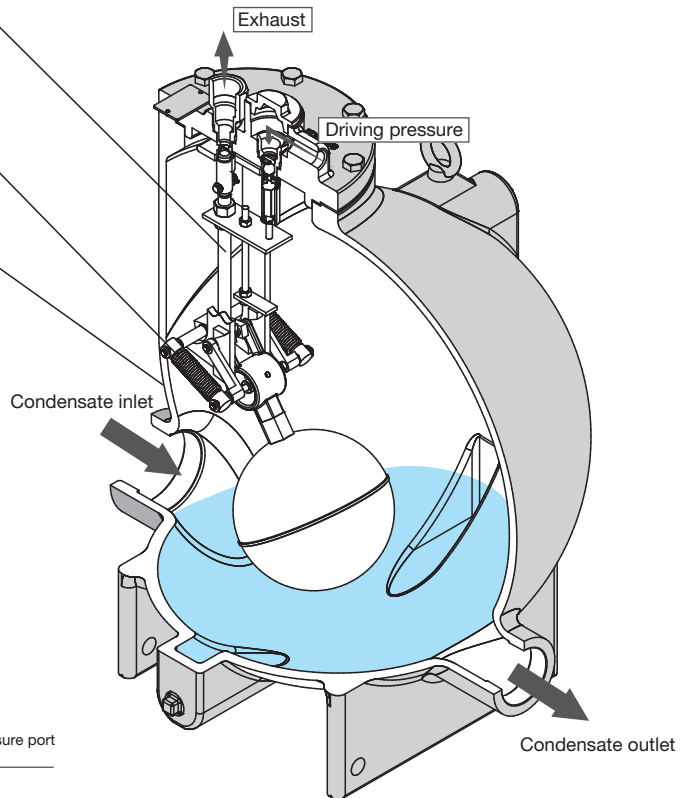
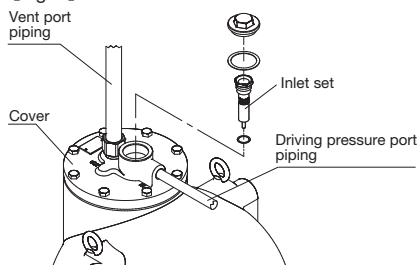
Easier Piping Installation

Making driving pressure port and vent port in vertical direction, piping installation becomes easier (see Fig. 1).

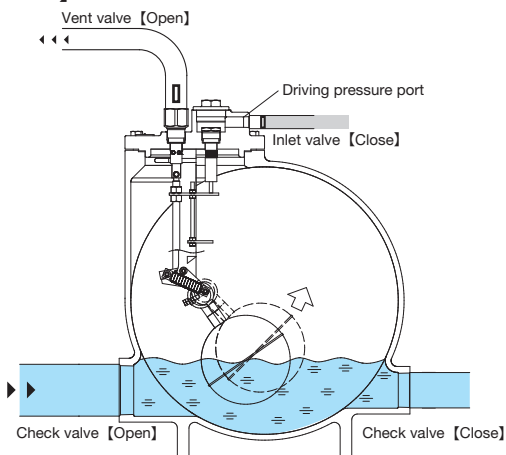
Improved Maintenanceability

As scale trouble remedy on initial air venting, inlet set can be replaced without removing cover and piping (see Fig. 1).

[Fig. 1]

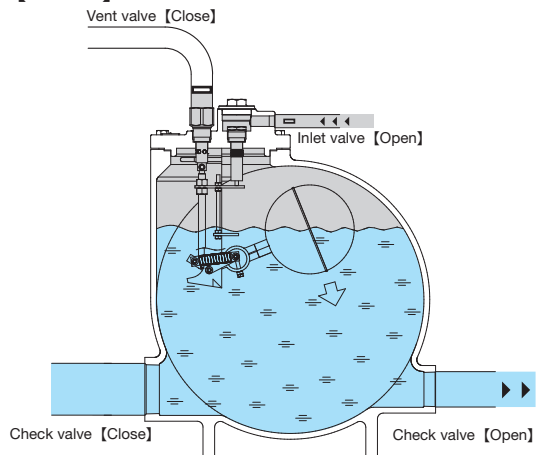


[State 1]



Condensate flows into body via condensate inlet and then float moves upward due to buoyancy. In this state, vent valve opens and inlet valve on driving pressure port is closed.




[State 2]



When condensate level rises and float reaches certain height, vent valve closes, inlet valve opens. Driving pressure enters body, and condensate is pumped from outlet. When condensate is discharged, float moves downward in line with water level in body. When float level is lowered to certain level, it returns to [State 1].



Assist Trap/Pumping Trap ID-Charts

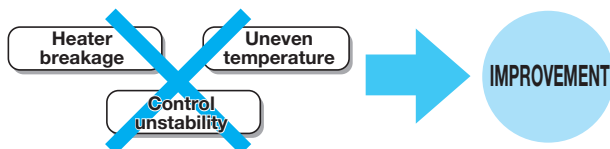
	Model	Material	Fluid	Max. driving pressure (MPa)	Maximum temperature (°C)	Connection	Size	Feature	Page
	TFA-2000	FCD450	Steam	0.5	160°C	JIS Rc	25A	· Assist trap (Float trap equipped with pump assist function)	6 -10
	PF-2000	FCD450	Steam, Air	0.5	160°C	JIS Rc	25A	· Pumping trap for small capacity	6 -12
	PF-7000	FCD450	Steam, Air	0.8	180°C	JIS Rc	25A-40A-50A	· Pumping trap	6 -14
							80A (Outlet: 50A)		

6

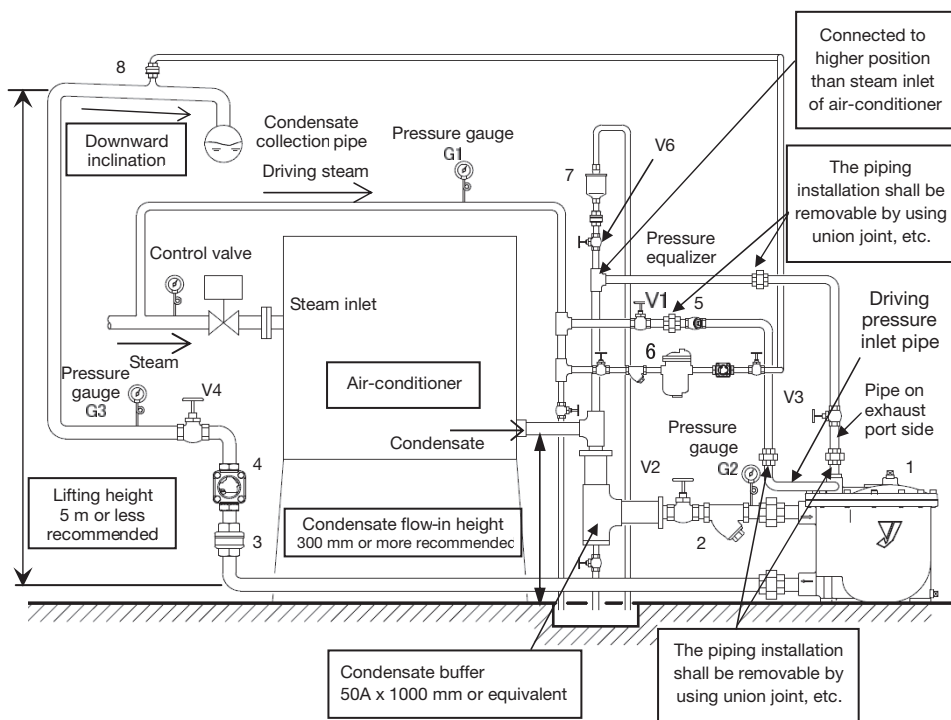
Assist Trap/Pumping Trap

■ Intended purpose is as follows:

- Air-conditioning at clean room
- Drying machine for gravure printing
- Drying machine for film processing



Example of measures to condensate accumulation in air-conditioner (countermeasures to stall)



* There is a possibility that the inside of the heat exchanger becomes vacuum pressure by the usage condition.

1		Assist trap TFA-2000	—	5		Strainer SY-5 15A (80mesh)	4
2		Strainer SY-5 25A (80mesh)	4	6		Steam trap TB-20 15A	5
3		Check valve SCV-2 25A	19	7		Air vent valve TS-7 15A	5
4		Sight glass SLM-1S 25A	7	8		Check valve SCV-2 15A	19

Guidelines for Pumping Trap


Step
3

■ Installation of receiver tank

Receiver tank is used for separation of flash steam and condensate, condensate temporary storage, protection of pumping trap, etc. Be sure to install receiver tank before using pumping trap.

• Sizing of open receiver (open system)

Open receiver tank requires capacity to store condensate when pumping trap works and discharges condensate. Also, since condensate pipe flows flash steam and condensate at the same time, open receiver tank separates condensate from flash steam, and send only condensate into pumping trap. Then, open receiver tank requires dimensions enough to separate flash steam and condensate.

1) Calculate flash steam amount

1 Calculate flash steam rate from usage condition, using the chart for condensate flash rate.

Ex) Condensate discharged from steam trap used in steam pressure 0.8 MPa to open receiver (atmospheric pressure), from the chart 1, flashes approximately 14%.

2 Calculate flash steam amount from condensate amount and flash rate. Flash steam Condensate amount Flash rate

Ex) If condensate amount is 1,000 kg/h, flash steam amount is $1,000 \times 14/100 = 140\text{kg/h}$

2) Calculate diameter of receiver tank from flash steam amount. (standatd length: 1 m)

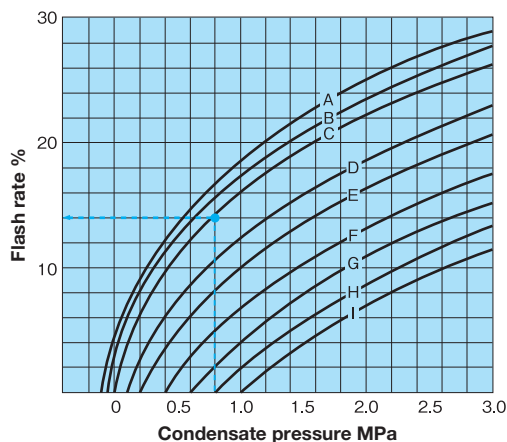
Ex) From calculated flash steam amount and the chart 2, vent piping diameter is found as intermediate between 80A and 100A, then select 100A. In the same way, diameter of open receiver is 200A (length: 1 m).

• Sizing of closed receiver (closed system)

Pumping trap requires capacity to store condensate temporarily during its operation. In relation to operation cycle, its capacity should be approximately 0.5% of condensate amount for an hour. For selection, use the chart 3.

Ex) If condensate amount is 1,000 kg/h, from the chart 3, when diameter of receiver tank is 80A, length is 1 m. When 100A, length is 0.65 m as a guide.

Chart 1 Flash rate of Condensate



Code	A	B	C	D	E	F	G	H	I
Back pressure MPa	- 0.05	- 0.03	Atmospheric pressure	0.1	0.2	0.4	0.6	0.8	1.0

Chart 2 Sizing cart of open receiver

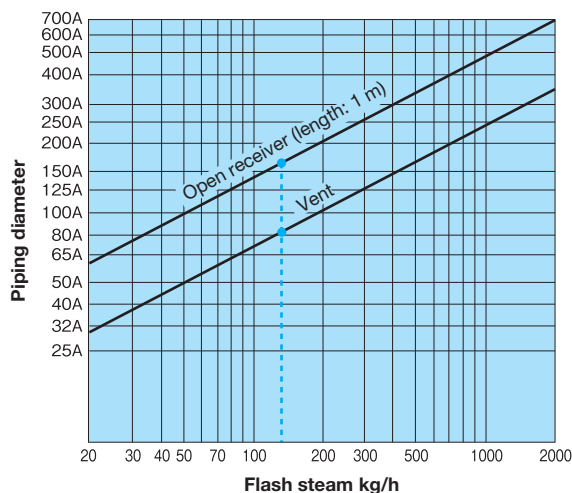
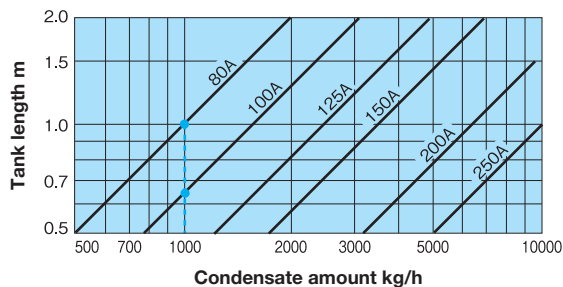
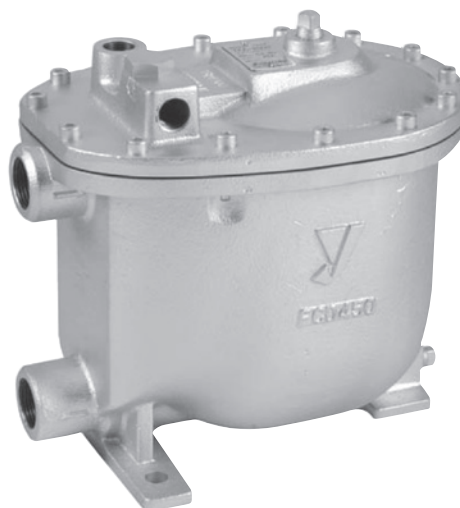


Chart 3 Sizing chart of closed receiver



TFA-2000



■Features

1. Float trap equipped with pump assist function.
2. Most appropriate for discharge of low pressure condensate at air-conditioning unit or heating unit.

· Intended purpose is as follows:

- Air-conditioning at clean room
- Drying machine for gravure printing
- Drying machine for film processing

■Specifications

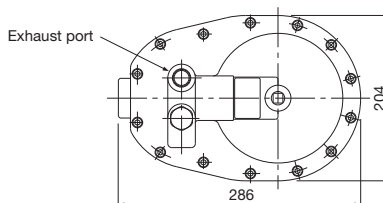
Nominal size		25A
Application		Steam condensate, Non-hazardous fluid
Driving fluid		Steam / Air
Max. working pressure		0.5 MPa
Driving pressure		0.03 to 0.5 MPa
Driving differential pressure		(Back pressure + 0.03 MPa) to 0.5 MPa
Max. working temperature		160°C
Material	Body	Ductile cast iron (FCD450)
	Trim parts	Stainless steel
	Float (P)	Stainless steel
Connection		JIS Rc screwed
Check valve at inlet side		Built-in (swing type)
Check valve at outlet side		Externally attached *

* Attach an optional check valve (SCV-2 or SCV-3) 25A on outlet side of the product.

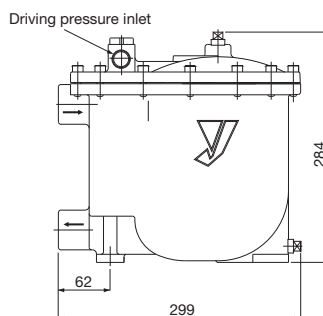
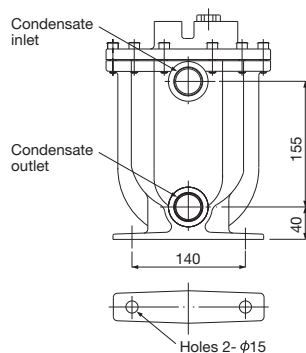
■Dimensions (mm) and Weights (kg)

<<Connection diameter>>

Condensate inlet	Condensate outlet	Driving pressure inlet	Exhaust port
Rc 1	Rc 1	Rc 1/2	Rc 1/2

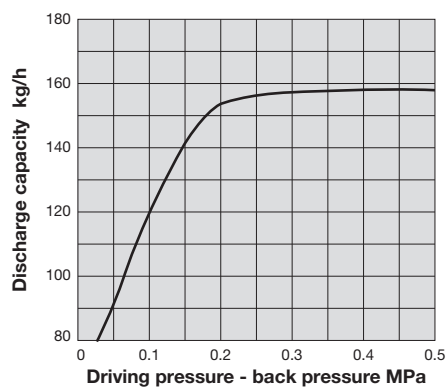


Weight: 17 kg

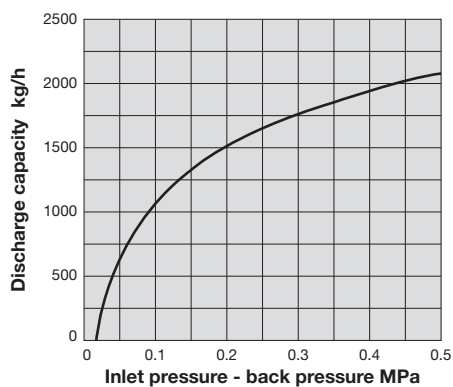


■Assist Capacity (Pump Capacity)

The assist capacity depends on the inflow height of condensate. Multiply the inflow height by the appropriate corrected coefficient shown in the table below.



■Steam Trap Capacity



■Corrected Coefficient for Assist

Inflow height (mm)	Corrected coefficient
250	0.65
300	1.0
400	1.1
500	1.75

PF-2000



■Features

1. Non-electric since it utilizes inexpensive steam pressure or air pressure for operation.
2. Maintenance inspection is easily done due to main parts are attached to the cover.
3. Due to ultra- compact design, it can be installed without significant modification even in tight spaces.

■Specifications

Nominal size	25A	
Application	Steam condensate, Non-hazardous fluid	
Driving fluid	Steam / Air	
Max. working pressure	0.5 MPa	
Driving pressure	0.03 to 0.5 MPa	
Driving differential pressure	(Back pressure + 0.03 MPa) to 0.5 MPa	
Max. working temperature	160°C	
Material	Body	Ductile cast iron (FCD450)
	Trim parts	Stainless steel
	Float(P)	Stainless steel
Connection	JIS Rc screwed	
Check valve at inlet side	Built-in (swing type)	
Check valve at outlet side	Externally attached *2	

*1 The most appropriate value of driving pressure is back pressure at outlet side + 0.1 to 0.2 MPa.

*2 Attach an optional check valve (SCV-2 or SCV-3) on inlet and outlet side of the product.

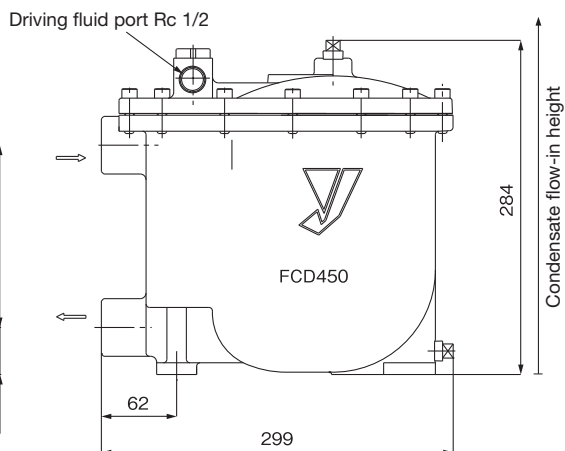
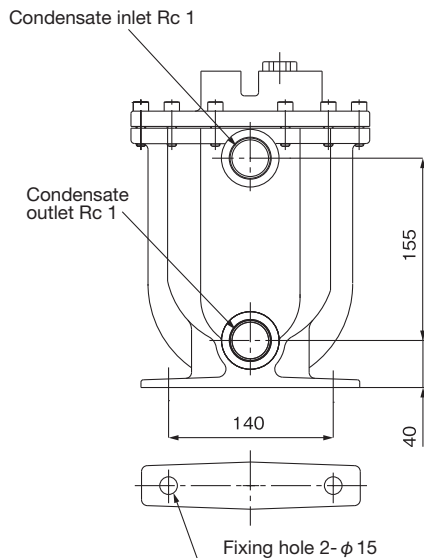
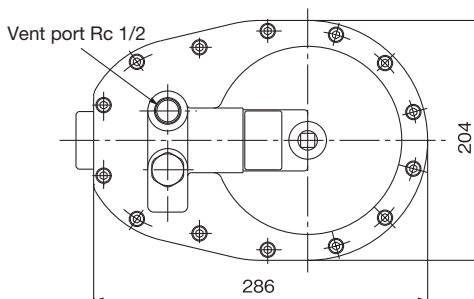


■Dimensions (mm) and Weights (kg)

<<Connection diameter>>

Condensate inlet	Condensate outlet	Driving fluid port	Vent port
Rc 1	Rc 1	Rc 1/2	Rc 1/2

Weight: 17kg



Flow Rate

(kg/h)

Driving pressure [MPa]	Back pressure [MPa]	Driven by steam	Driven by air
0.1	0.05	364	671
0.2		508	763
0.3		606	781
0.4		664	795
0.5		666	800
0.2	0.1	309	725
0.3		454	756
0.4		508	764
0.5		513	769
0.3	0.2	282	699
0.4		315	724
0.5		319	730
0.4	0.3	243	656
0.5		292	695
0.5	0.4	208	643

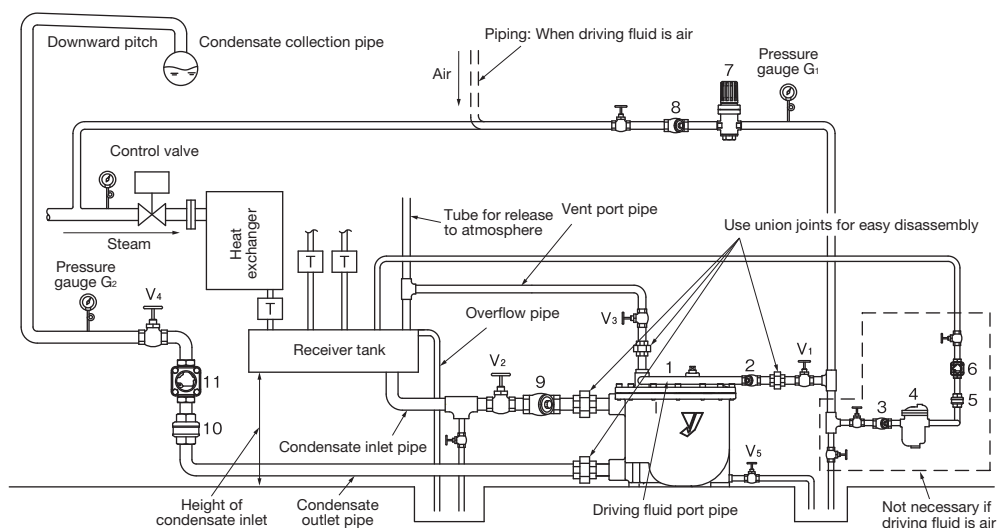
* Flow rate described above indicates condensate volume when condensate flow-in height is 800 mm above bottom of the product.

Flow Rate Correction Coefficient (Piping Example)

Discharge capacity varies depending on height of the condensate inlet. Multiply the volume by the following factors according to the height of the condensate inlet.

* Condensate flow-in height means the height from the bottom of the product to bottom part of receiver.

Driving fluid	Condensate flow-on height [mm]				
	600	800	1000	1200	1400
Steam	0.90	1.0	1.05	1.10	1.15
Air	0.85	1.0	1.15	1.25	1.35



No.	Name	No.	Name
1	Pumping Trap	5,10	Check valve
2,3,8,9	Strainer	6,11	Sight glass
4	Steam trap	7	Pressure reducing valve

PF-7000

■Features

1. Non-electric since it utilizes inexpensive steam pressure or air pressure for operation.
2. Maintenance inspection is easily done due to main parts are attached to the cover.
3. Untouchable by hand due to automatic operation after installation.
4. Running costs can be significantly reduced since gas for the operation is consumed only at the time of pumping.



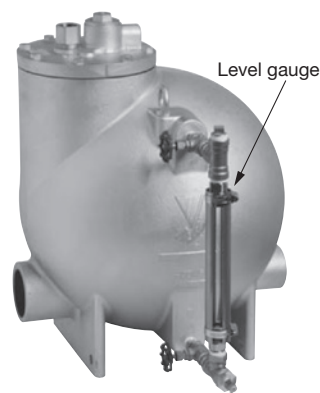
■Specifications

Model		PF-7000
Nominal size		25A (Condensate inlet: 25A / Condensate outlet: 25A)
		40A (Condensate inlet: 40A / Condensate outlet: 40A)
		50A (Condensate inlet: 50A / Condensate outlet: 50A)
		80A (Condensate inlet: 80A / Condensate outlet: 50A)
Application		Steam condensate, Non-hazardous fluid
Driving fluid		Steam / Air
Max. driving pressure		0.8 MPa *1
Max. working temperature		180°C
Material	Body	Ductile cast iron (FCD450)
	Trim parts	Stainless steel
	Float (P)	Stainless steel
Connection		JIS Rc screwed
Check valve at inlet and outlet side		Externally attached *2

*1 The most appropriate value of driving pressure is back pressure at outlet + 0.1 to 0.2 MPa.

*2 Attach an optional check valve (SCV-2 or SCV-3) on inlet and outlet side of the product.

■Option

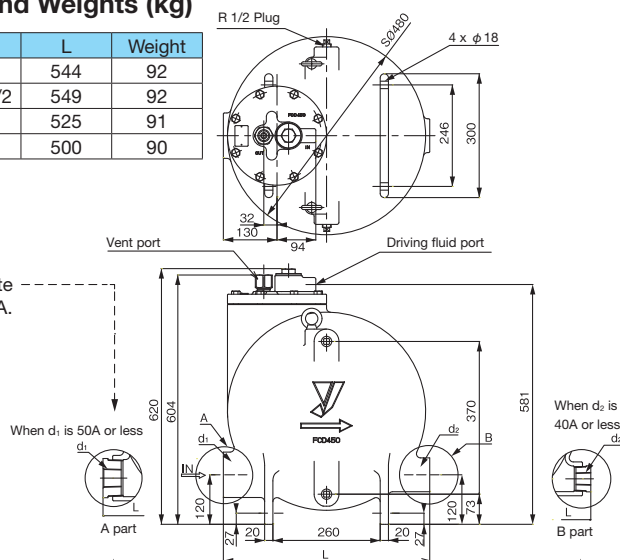


■Dimensions (mm) and Weights (kg)

Nominal size	d ₁	d ₂	L	Weight
25A	Rc 1	Rc 1	544	92
40A	Rc 1-1/2	Rc 1-1/2	549	92
50A	Rc 2	Rc 2	525	91
80A	Rc 3	Rc 2	500	90

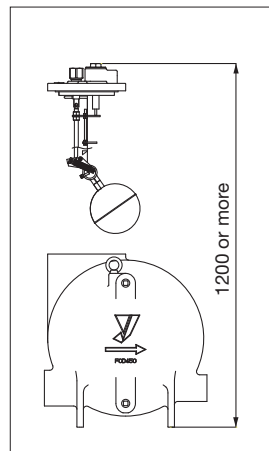
Driving fluid port	Vent port
Rc 1/2	Rc 1

* Bush is attached at condensate inlet for the product of size 50A.

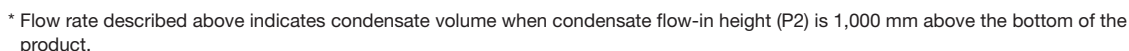


* Bush is attached at condensate inlet and outlet for size 25A and 40A.

■Maintenance Space



<Driving fluid: steam>

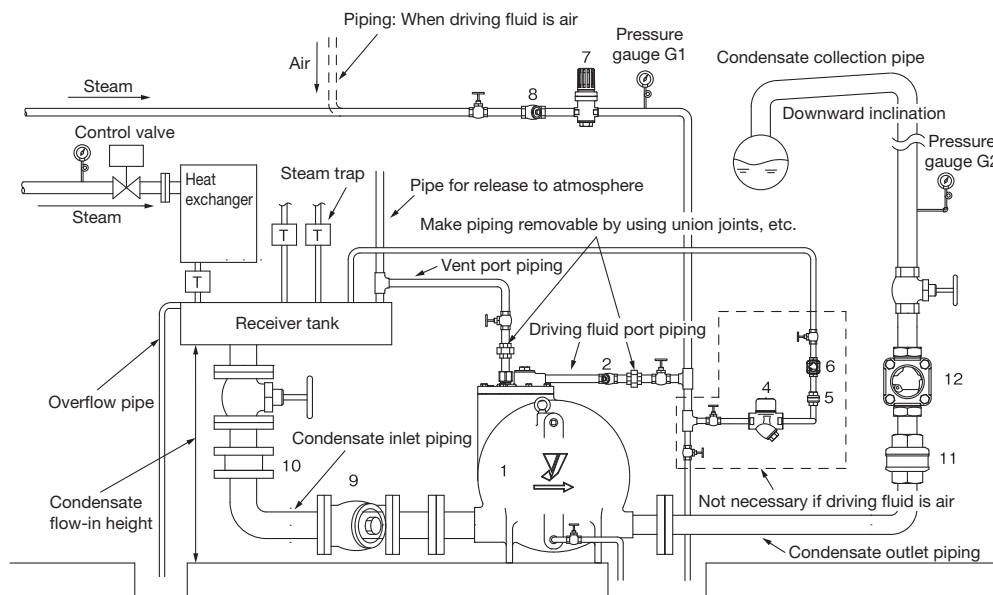


- Discharge capacity varies depending on condensate flow-in height. Multiply the volume by the following factors according to condensate flow-in height (P2).
- Condensate flow-in height means the level above the bottom of the product.

- | Driving fluid | Condensate flow-in height [mm] | | | |
|---------------|--------------------------------|------|------|------|
| | 800 | 1000 | 1200 | 1400 |
| Steam | 0.85 | 1.00 | 1.05 | 1.15 |
| Air | 0.85 | 1.00 | 1.15 | 1.30 |

Driving fluid	Size (Condensate inlet-outlet)			
	80A-50A	50A-50A	40A-40A	25A-25A
Steam	1.00	0.90	0.70	0.35
Air	1.00	0.95	0.70	0.30

Pumping trap is that the drain from receiver tank pumped to the condensate collection pipe by operation of steam pressure or air pressure.



No.	Name	No.	Name	No.	Name
1	Pumping trap	4	Steam trap	6, 12	Sight glass
2, 8, 9	Strainer	5, 10, 11	Check valve	7	Pressure reducing valve

MEMO