

# TLV<sup>®</sup>

# PowerTrap<sup>®</sup>

Mechanical Pump & Pump/Trap

**GP Series**  
**GT Series**



# Effective Condensate Processing Improves Plant Efficiency

Increased productivity and product quality, plus reduced energy consumption and water treatment are some of the many benefits of condensate drainage and recovery.

The TLV GP/GT PowerTrap series provides the perfect solution for optimizing condensate processing in many applications.

## 1 Prevention of Heat Exchanger "Stall"

- Stabilized temperature control improves product quality
- Elimination of water hammer prevents equipment damage and improves safety
- Prevention of corrosion caused by condensate accumulation
- Some models are designed for installation with a lower filling head (min. 155 mm, 300 mm, etc.)

## 2 Effective Condensate Recovery

- Energy recovered from condensate reduces boiler fuel costs
- Reusing water reduces water treatment costs
- Reduces effluent treatment and disposal costs

## 3 No Cavitation

- Recovery of hot condensate up to 220 °C possible without cavitation
- Low filling head allows use with equipment situated at low levels
- Eliminates the seal, bearing and impeller damage that can occur in standard centrifugal pumps

## 4 No Electricity Required

- Ideal for use in areas requiring explosion-proof equipment, and areas with no electrical supply
- Reliable mechanical operation eliminates the need for complex level controls
- Quick and easy to install and maintain



# TLV's PowerTrap Series— The Total Solution to Heat Exchanger “Stall”

## ■ Importance of “Stall” Prevention

“Stall” prevents condensate from being discharged from heating equipment. It results in:

### ● Process Temperature Swings

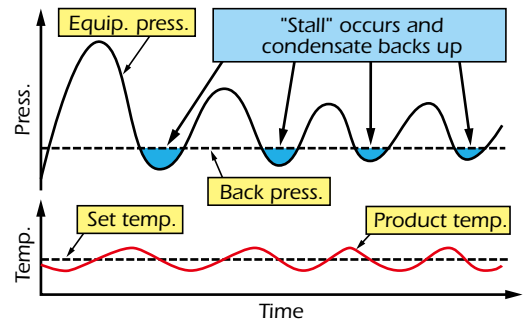
As the “stall” cycle repeats, the steam pressure in the equipment varies above and below the back pressure, causing product temperature and quality fluctuations.

### ● Water Hammer Damage

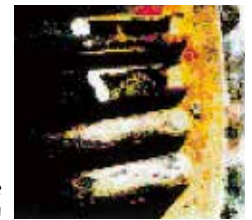
Water hammer can occur when backed-up condensate re-evaporates, or as incoming hot steam hits cooler backed-up condensate and instantly condenses.

### ● Tube Corrosion and Damage

Backed-up condensate in the equipment can form carbonic acid, which results in tube corrosion. Equipment temperature fluctuations can cause thermal shock and fatigue damage to tubes.



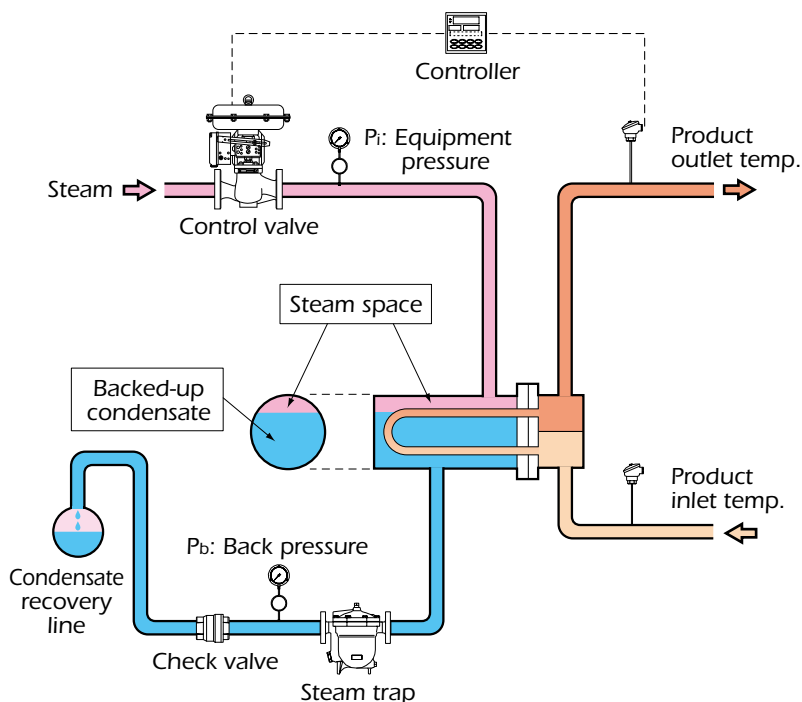
Water hammer damage to tubes and stays



Tube corrosion

**TLV's PowerTrap series provides complete condensate drainage, the key to eliminating “stall” and its related problems. Optimum performance can now be yours with the PowerTrap.**

## ■ A Closer Look at the “Stall” Cycle



- ① When the demand for heating energy is high, the control valve is wide open,  $P_i$  is greater than  $P_b$  and condensate is discharged from the trap.
- ② When the demand decreases, the control valve throttles in order to reduce the heating energy, and  $P_i$  drops.
- ③ If  $P_i$  drops to  $P_b$  or below, the trap can no longer discharge condensate against the back pressure. Condensate then backs up in the heat exchanger, and the equipment becomes condensate logged. This condition is known as “stall”.
- ④ When condensate is backed-up inside the equipment, the product temperature falls. The system compensates by opening the control valve again.  $P_i$  increases and, when it becomes greater than  $P_b$ , condensate is forced out through the trap, and the cycle begins again.



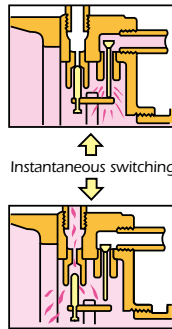
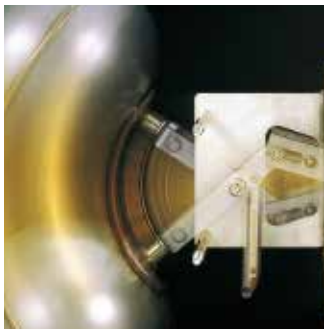
# PowerTrap Benefits

## 1 Built-in Steam Trap Improves Performance (GT Series)



- Automatically switches between pump and trap operation, in response to process conditions
- Internal trap mechanism always matches pump output, with no damage to trap, and eliminates need for sizing
- No need for external steam trap means simplified compact design and lowered installation costs
- Trap body and plug are both stainless steel for minimum leakage and maximum life

## 2 Snap-action Mechanism Maximizes Life



- Heat-treat hardened stainless steel internals
- Durable nickel-based alloy compression coil spring\*
- The instantaneous snap-action mechanism simultaneously opens or closes motive medium inlet and exhaust valves, preventing erosion and resultant leakage

\* Except GP/GT5C



## 3 Low-maintenance Design Reduces Labor



- Easy inline maintenance, without removal of piping\*
- Fast and easy cleaning of intake valve by simply opening a plug to remove (GP/GT14, GP/GT10, GP10F, GP/GT5C)
- Non-cavitating design eliminates the seal, bearing and impeller damage that can occur in standard centrifugal pumps

\* GP10F, GP/GT5C: motive medium piping must be removed



## 4 Stainless Steel Check Valves\* for Durability



- Center guided check valves CK3MG and CKF3MG are used for maximum reliability even with dirty condensate (GP/GT14, GP/GT10, GP/GT10L, GP10F)
- Newly developed swing type check valve CKF5M enables use with a filling head as low as 300 mm (GP/GT14L, GP/GT10L), 350 mm (GP/GT14M)
- Lasts longer than bronze check valves
- Quiet operation

\* GP/GT5C are equipped with internal stainless steel check valves

## 5 Economical Unit with Retrofittable Mechanism

(Only available in some countries)

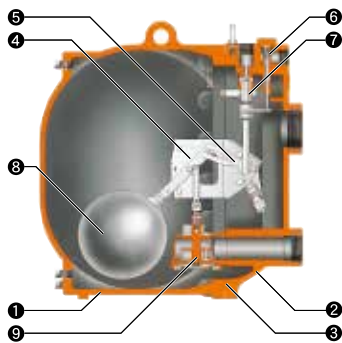


- One-piece pump assembly for easy installation and maintenance and retrofit to pump bodies of certain other manufacturers
- Lighter-weight model, with straight-through connection for easy installation

# Construction

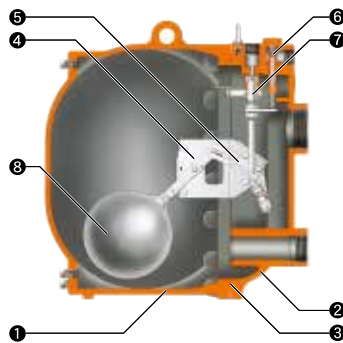
## GT14/GT14M/GT14L GT10/GT10L

Mechanical pump with built-in trap



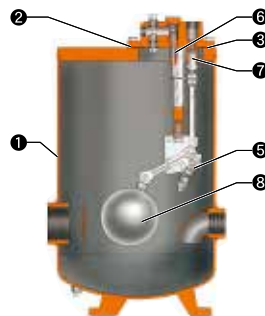
## GP14/GP14M/GP14L GP10/GP10L

Mechanical pump



## GP10F

Mechanical pump with retrofitable mechanism

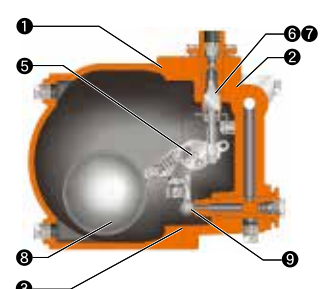


## GT5C

Compact mechanical pump with built-in trap

## GP5C

Compact mechanical pump



GT5C shown above  
GP5C not equipped with trap unit

## Materials

1	Body (except GP10F, GP/GT5C)	Cast Iron or Cast Steel*	4	Lever Unit (GP/GT14, GP/GT10 only)	Stainless Steel
	Body (GP10F)	Fabricated Carbon Steel**			
	Body (GP/GT5C)	Cast Iron or Cast Stainless Steel			
2	Cover (except GP10F, GP/GT5C)	Cast Iron or Cast Steel*	5	Snap-action Unit	Stainless Steel
	Cover (GP10F)	Cast Steel**			
	Cover (GP/GT5C)	Cast Iron or Cast Stainless Steel			
3	Cover Gasket (GP/GT14M, GP/GT14L, GP/GT10, GP/GT10L, GP10F)	Graphite Compound	6	Intake Valve Unit	Stainless Steel
	Cover Gasket (GP/GT14)	Graphite/Stainless Steel			
	Cover Gasket (GP/GT5C)	Fluorine Resin			
			7	Exhaust Valve Unit	Stainless Steel
			8	Float	Stainless Steel
			9	Trap Unit	Stainless Steel
			10	Check Valve***	Stainless Steel
			11	Air Vent Unit*** (GT5C only)	Stainless Steel

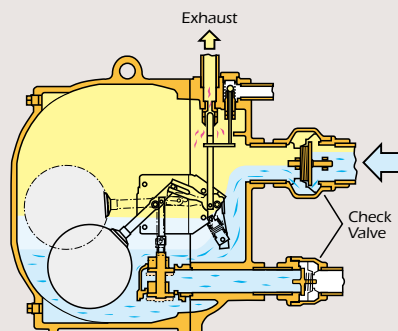
\* Cast stainless steel available as option \*\* Stainless steel available as option \*\*\* Not shown

# Operation

## Pump/Trap: GT10

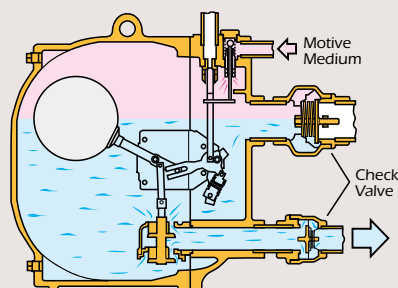
### 1 GT Trapping/Filling Cycle

When GT inlet pressure is greater than back pressure, the GT acts as a trap, continuously discharging condensate. When inlet pressure is less than back pressure, condensate cannot be discharged, so it accumulates in the body, causing the float to rise. As the float rises, the trap opens, although condensate still cannot be discharged.



### 2 GT Discharge Cycle

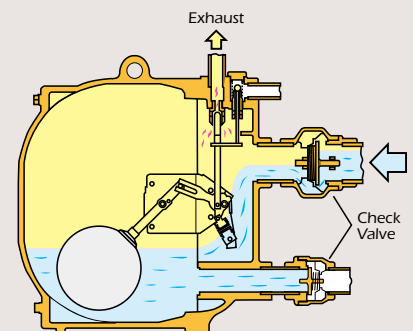
When the float reaches its highest position, the trap is fully open and the snap-action mechanism actuates, instantly both opening the motive medium intake valve and closing the exhaust valve. The motive medium pressure forces out the condensate, and the float falls. The snap-action mechanism re-sets, instantly opening the exhaust valve and closing the intake valve. The cycle then repeats.



## Pump: GP10

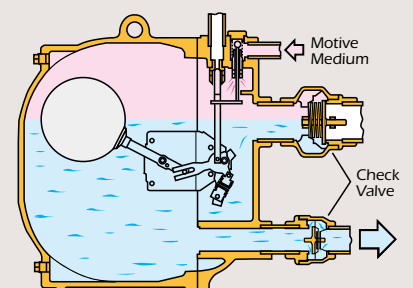
### 1 GP Filling Cycle

The pump body is equalized to the inlet receiver (usually atmospheric) by the open exhaust valve. This allows condensate to drain by gravity into the pump, where it accumulates and causes the float to rise.



### 2 GP Discharge Cycle

When the float reaches its highest position, the snap-action mechanism actuates, instantly both opening the motive medium intake valve and closing the exhaust valve. The motive medium pressure forces out the condensate, and the float falls. The snap-action mechanism re-sets, instantly opening the exhaust valve and closing the intake valve. The cycle then repeats.



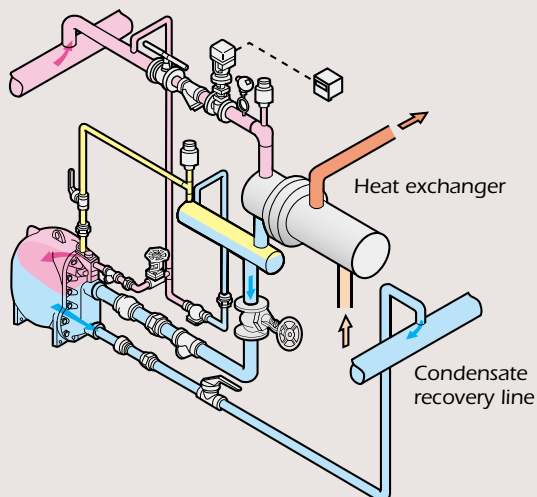
# Systems for Many Different Applications

The TLV PowerTrap series meets a variety of condensate processing needs.

	Closed System			Open System		
System Overview						
Benefits	<ul style="list-style-type: none"> <li>No need for external steam trap (GT model features built-in trap)</li> <li>No flash steam discharge</li> <li>Small reservoir</li> <li>Use with vacuum equipment possible</li> </ul>			<ul style="list-style-type: none"> <li>Collection of condensate from multiple equipment possible</li> <li>Can be used where trap is lower than receiver, such as equipment situated near grade (providing there is sufficient differential pressure)</li> </ul>		
Notes	<ul style="list-style-type: none"> <li>Only one piece of equipment possible per system</li> <li>Equipment has minimum height requirement to ensure that condensate flows naturally, by gravity (approx.: GP/GT14, GP/GT10 - 0.8 m; GP10F - 1 m; GP/GT14M - 0.35 m; GP/GT14L - 0.3 m; GP/GT10L - 0.3 or 0.5 m; GT5C - 170 mm)</li> </ul>			<ul style="list-style-type: none"> <li>Separate steam trap required for each piece of equipment</li> <li>Requires venting pipe to discharge flash steam to atmosphere</li> </ul>		
Approx. Max. Pump Discharge Capacity	<ul style="list-style-type: none"> <li>less than 8 t/h (GT10)</li> <li>less than 5.5 t/h (GT14)</li> <li>8 t/h and greater (install pumps in parallel)</li> </ul>	<ul style="list-style-type: none"> <li>less than 3.4 t/h (GT14M)</li> <li>less than 2.2 t/h (GT14L)</li> </ul>	<ul style="list-style-type: none"> <li>less than 1.4 t/h (GT10L)</li> <li>less than 250 kg/h (GT5C)</li> </ul>	<ul style="list-style-type: none"> <li>less than 9 t/h (GP10, GP10F)</li> <li>less than 6 t/h (GP14)</li> <li>9 t/h and greater (install pumps in parallel)</li> </ul>	<ul style="list-style-type: none"> <li>less than 4 t/h (GP14M)</li> <li>less than 2.4 t/h (GP14L)</li> </ul>	<ul style="list-style-type: none"> <li>less than 1.5 t/h (GP10L)</li> <li>less than 260 kg/h (GP5C)</li> </ul>
Model	Mechanical pump with built-in trap <b>GT14/GT10</b>	Mid-size mechanical pump with built-in trap <b>GT14M/GT14L</b>	Compact mechanical pump with built-in trap <b>GT10L/GT5C</b>	Mechanical pump <b>GP14/GP10/GP10F</b>	Mid-size mechanical pump <b>GP14M/GP14L</b>	Compact mechanical pump <b>GP10L/GP5C</b>
	Where there is <b>ALWAYS</b> a <b>negative</b> pressure differential (e.g. vacuum equipment), <b>GP14/GP14M/GP14L/GP10/GP10L/GP10F</b> can be used					
Some Application Examples	Large process/flow, such as: re-boilers, large heat exchangers	Small to medium process/flow, such as: room heaters, small to medium heat exchangers		Large process trap discharges, such as: cylinder dryers, platen presses	Small to medium process trap discharges, such as: recovery: trace lines & mains, small to medium heat exchangers	

## Closed System (GT)

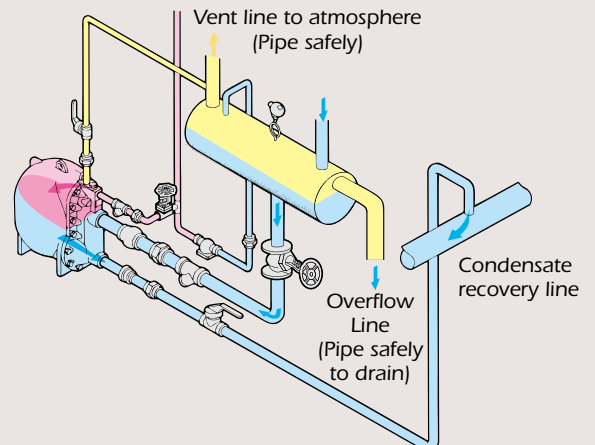
Sample Application:  
Condensate Drainage & Recovery from Heat Exchanger



- Collection of condensate up to 185 °C possible
- Prevents clouds of steam from affecting the work environment

## Open System (GP)

Sample Application:  
Condensate Recovery from an Open Tank



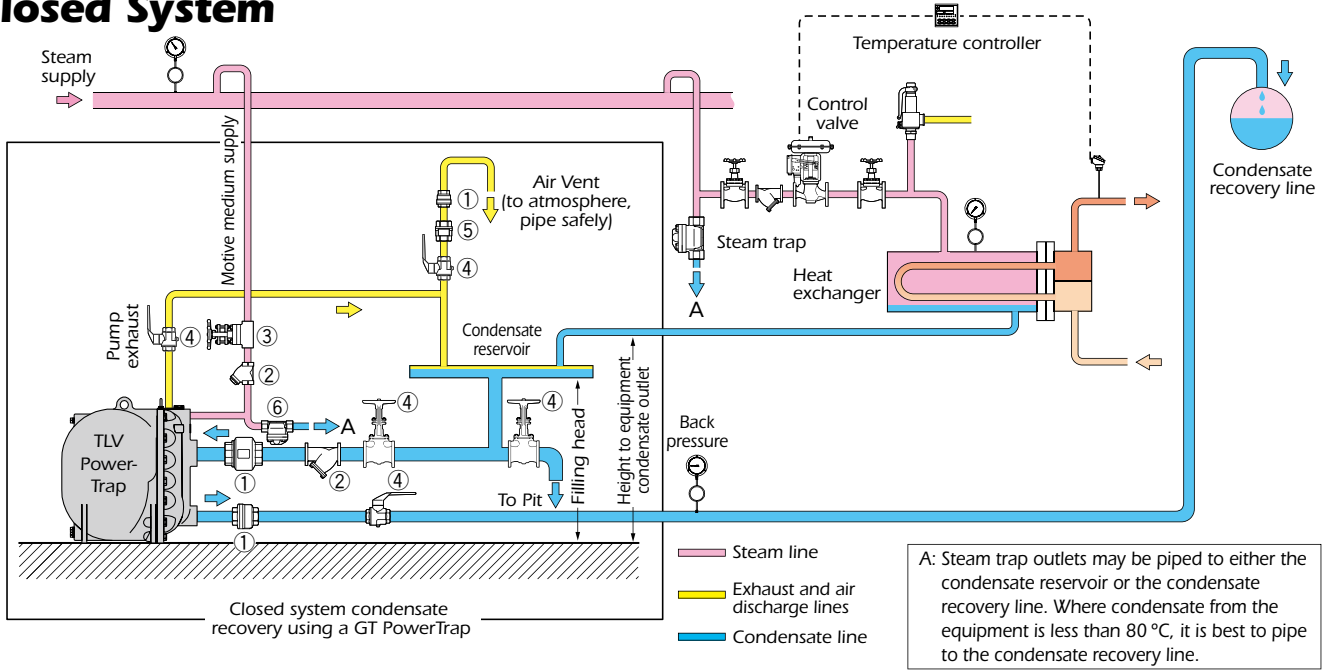
- Collection of condensate up to 100 °C possible
- Makes it easy to design systems that can easily obtain pressure differential

**CAUTION** Pipe all atmospheric discharge to a safe area

# Installation Piping Examples

(For explanation purposes only, not intended as installation designs.)

## ● Closed System

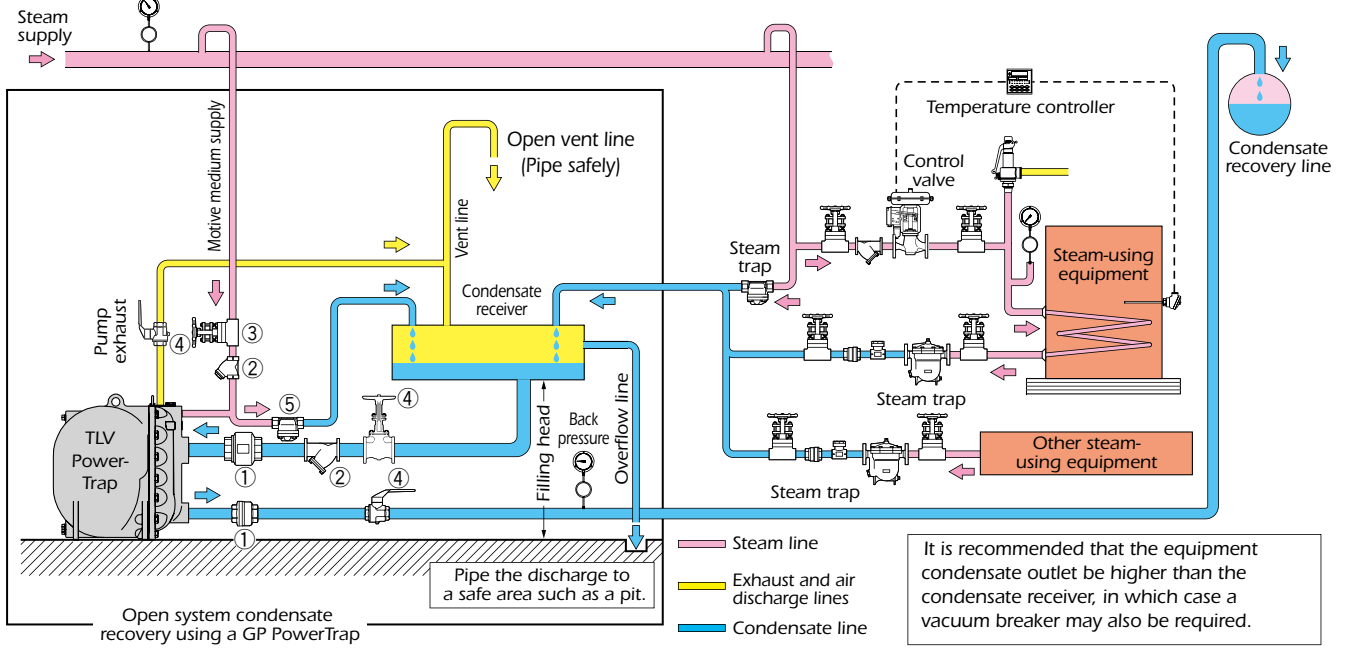


- ① Check valve
- ② Strainer; 40 mesh or finer
- ③ Gate valve or needle valve
- ④ Gate valve or ball valve
- ⑤ Air vent
- ⑥ Steam trap

**CAUTION**

- In closed system applications where steam condensate is pumped, use steam as the motive medium.
- The height of the condensate outlet on the equipment must be at least: filling head + diameter of reservoir.
- Please read the instruction manual to ensure safe usage.

## ● Open System



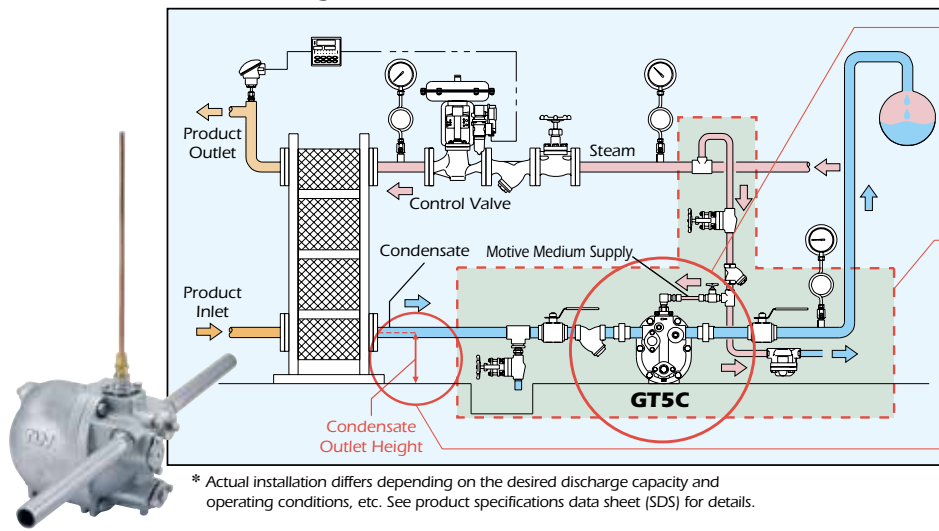
- ① Check valve
- ② Strainer; 40 mesh or finer
- ③ Gate valve or needle valve
- ④ Gate valve or ball valve
- ⑤ Steam trap

**CAUTION**

- The vent pipe and overflow pipe should discharge to a safe place.
- Please read the instruction manual to ensure safe usage.



## ● Installation Piping Example for GT5C\*



\* Actual installation differs depending on the desired discharge capacity and operating conditions, etc. See product specifications data sheet (SDS) for details.

### Easy Maintenance

- Inlet/outlet check valves and motive medium intake valve unit are removable while connected to the piping
- The unit can be disconnected by removing only two bolts
- The body can be disassembled by removing six bolts while still connected to the piping

### Simple Installation

- Only motive medium intake pipe - no exhaust pipe necessary
- Inlet/outlet piping is linear, streamlined and efficient
- Built-in air vent and check valves minimize external installation

### Condensate Outlet Height of 170 mm

Usable with low condensate outlet heat exchangers

## Specifications

Values attained using a TLV CK3MG (screwed) or CKF5M/CKF3MG (flanged) check valve, unless otherwise indicated. GP/GT5C have a built-in check valve.

Model	GT14	GP14	GT10	GP10	GT14M	GP14M	GT14L	GP14L	GT10L	GP10L	GP10F	GT5C	GP5C							
Approx. Max. Pump Discharge Capacity	5.5 t/h	6 t/h	8 t/h	9 t/h	3.4 t/h	4 t/h	2.2 t/h	2.4 t/h	1.4 t/h	1.5 t/h	9 t/h	250 kg/h	260 kg/h							
Approx. Built-in Trap Cap.	36 t/h	—	40 t/h	—	14 t/h	—	13 t/h	—	12 t/h	—	—	1 t/h	—							
Dimensions (mm)																				
Connection*1	S	F	S	F	S	F	S	F	S	F	S	F	S	F						
Body Material & Weight (kg)	Cast Iron	127	—	124	—	127	—	124	—	86	85	56	55	46	45	Carbon Steel 70	20	23	20	23
	Cast Steel	139	149	136	146	139	149	136	146	94	93	61	60	50	49		—	—	—	—
	Cast Stainless Steel	—	—	—	—	—	—	—	—	—	—	—	—	—	—		18	21	18	21
Size (mm)	Pumped Med. Inlet	80	50, 80	80	50, 80	80	50, 80	80	50, 80	40		25, 40	25	25, 40	25	80	25			
	Pumped Med. Outlet	50				40				25		25		50		25				
	Motive Med. Inlet	25				15				15		15		20		15				
	Pump Exhaust Outlet	25				15				15		15		25		10		8		
Max. Oper. Press. PMO	1.4 MPaG				1.05 MPaG				1.4 MPaG		1.05 MPaG		0.5 MPaG							
Max. Oper. Temp. TMO	200 °C				185 °C				220 °C		185 °C		220 °C		185 °C					
Motive Med. Press.	1.0 - 1.4 MPaG				0.03 - 1.05 MPaG				0.03 - 1.4 MPaG		0.03 - 1.05 MPaG		0.03 - 0.5 MPaG							
Max. Allow. Back Press.	1.05 MPaG*2				1 MPaG*2				1.35 MPaG*2		1 MPaG*2		0.45 MPaG*2							
Motive Medium*3	GT Series: Saturated Steam GP Series: Saturated Steam, Compressed Air, Nitrogen																			
Pumped Medium*4	GT Series: Steam Condensate GP Series: Steam Condensate, Water																			
Filling Head*5 (mm)	Standard 860 Minimum 710				Std. 630 Min. 350		Std. 630 Min. 300		Std. 630 Min. 450 (300 w/ CKF5M)		Std. 1070 Min. 840		Min. 155		Std. 300 Min. 155					
Steam/Air Consumption*6	1.7 kg steam 6 m <sup>3</sup> compressed air*7 (GP Series)										2 kg steam 6.5 m <sup>3</sup> air*7		—							

\*1 S = screwed, F = flanged \*2 Motive medium pressure minus back pressure must be greater than 0.05 MPa

1 MPa = 10.197 kg/cm<sup>2</sup>

\*3 Do not use with toxic, flammable or otherwise hazardous fluids. \*4 Do not use for fluids with specific gravities under 0.85 or over 1, or for toxic, flammable or otherwise hazardous fluids. \*5 Measured from grade \*6 At 0.1 MPaG back pressure, per 1,000 kg condensate

\*7 Equivalent consumption of air at 20 °C under atmospheric pressure

PRESSURE SHELL DESIGN CONDITIONS (NOT OPERATING CONDITIONS):

Maximum Allowable Pressure (MPaG) PMA: GP/GT14, GP/GT10: 1.4 (C.I.), 1.6 (C.S.); GP/GT14M, GP/GT14L, GP/GT10L: 1.6 (C.I.), 2.1 (C.S.); GP10F: 1.05; GP/GT5C: 1.0

Maximum Allowable Temperature (°C) TMA: GP/GT14, GP/GT10, GP/GT10L, GP10F, GP/GT5C: 220; GP/GT14M, GP/GT14L: 220 (C.I.), 260 (C.S.)

Full product details (sizes, pressures, capacities and materials) are included in the individual specification data sheets (SDS).



To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

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Manufacturer

**TLV** CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001

ISO 9001  
ISO 14001



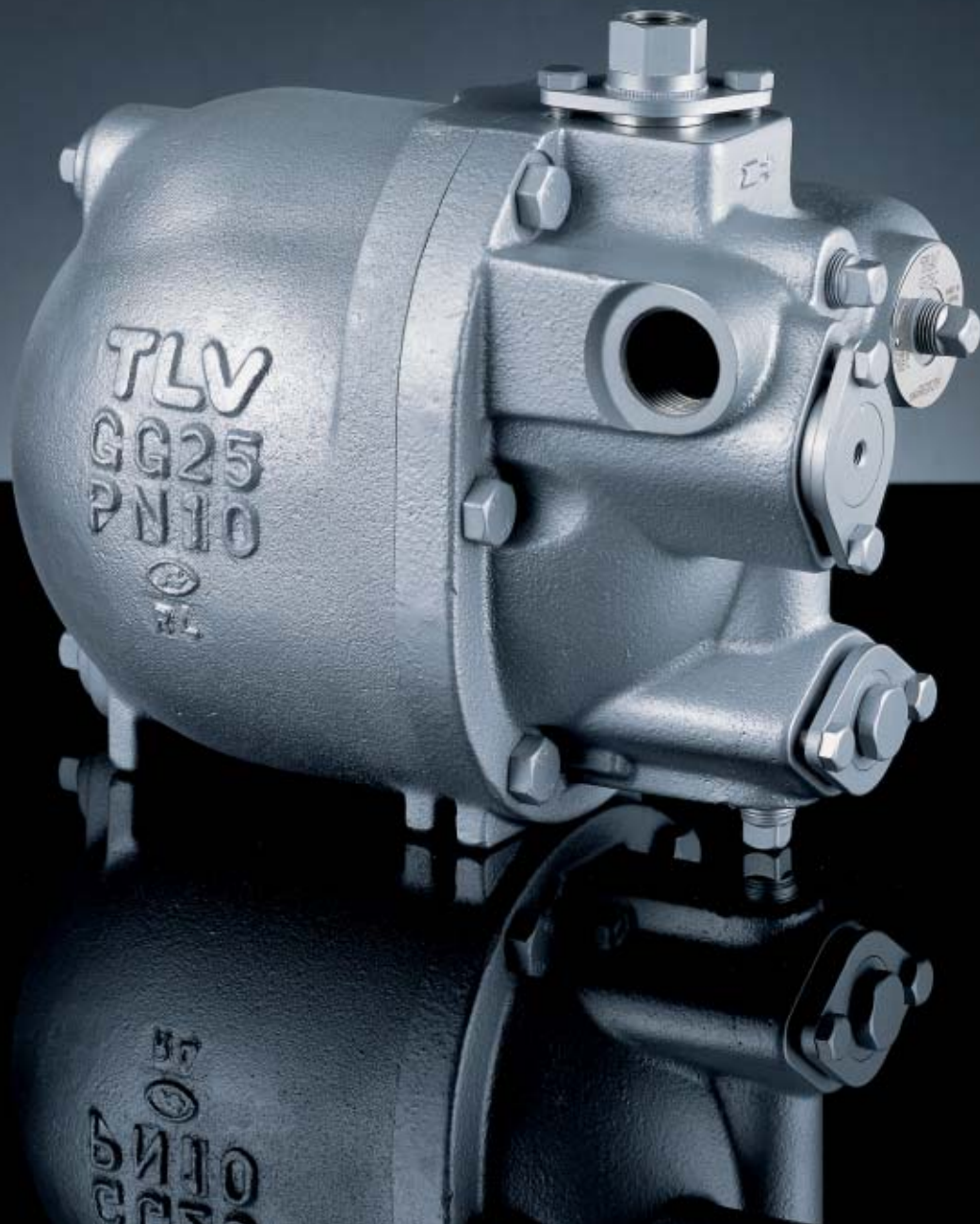


# TLV<sup>®</sup>

# PowerTrap<sup>®</sup>

## GT5C

**Compact Mechanical Pump  
with Steam Trap Designed  
to Eliminate Stall**



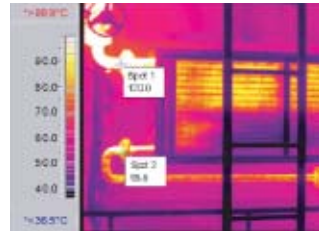
# Stall-Eliminating Pump/Trap

for Small Steam-using Equipment

## Is Your Air Conditioner, Dryer or Heater Damaged?

Does it Exhibit Signs of Water Hammer, Corrosion or Uneven Heating?

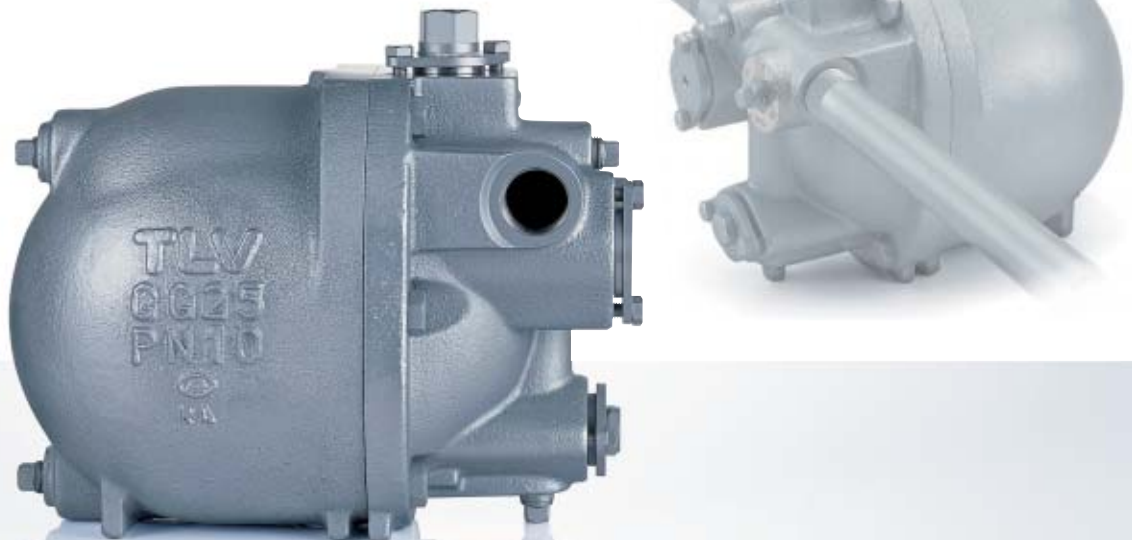
These problems could be caused by condensate accumulating in the equipment. This phenomenon is known as 'stall' and causes damage to equipment along with poor product quality if left untreated. As a steam trap cannot discharge condensate during a stall, further investment such as installing a vacuum pump in addition to the existing steam trap is required.



Air heater during the 'stall' phenomenon

## Discharging Condensate Even Without Pressure Differential

TLV developed the **PowerTrap** GT series combination mechanical pump and steam trap to overcome this challenge. The **PowerTrap GT5C** is a practical solution, featuring a linear inlet/outlet, low filling head, and simple piping installation, eliminating anxiety about stall in your small steam-using equipment.



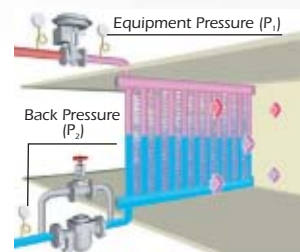
## 'Stall' Phenomenon

When the steam pressure inside a heat exchanger becomes lower than the outlet pressure (back pressure), condensate accumulates inside the equipment without being discharged from the trap causing damage/breakage by water hammer, and holes by corrosion and/or uneven heating.



### The Stall Mechanism

When load in the equipment decreases, the control valve throttles and the pressure inside the equipment drops. When pressure inside the equipment ( $P_1$ ) drops to back pressure ( $P_2$ ) or below, the condensate accumulates in the equipment, causing stall. It is most frequent during low-load operation.

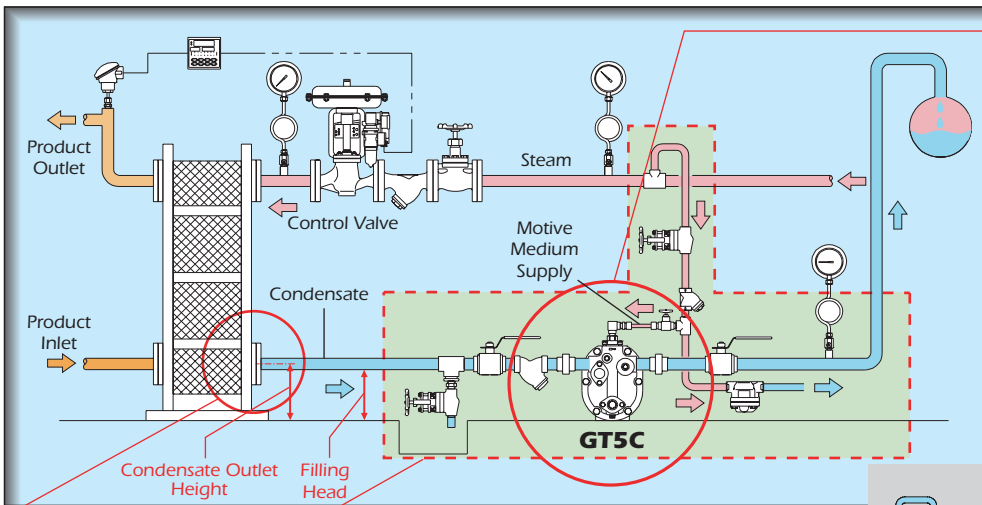




# Compact Fusion of Mechanical Pump and Steam Trap with Low Filling Head

The **PowerTrap GT5C** is an incredibly compact mechanical pump with a steam trap not only discharging condensate when pressure inside the equipment is high, but also pumping out condensate by using steam as a motive medium when the pressure inside the equipment is low. The **GT5C** also enables simplified piping in comparison to existing mechanical pumps.

## Installation Piping Example\*



### Easy Maintenance

- Inlet/outlet check valves and motive medium intake valve unit are removable while connected to the piping
- These valves/units can be removed by loosening two bolts
- The body can be disassembled by removing six bolts while still connected to the piping

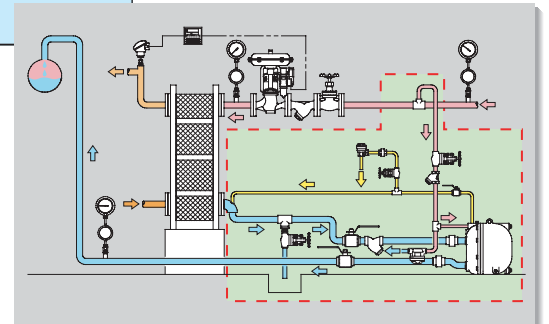
\*Actual installation differs depending on the desired discharge capacity and operating conditions, etc. Exhaust pipe recommended for some installations. See product specifications data sheet (SDS) for details.

### Condensate Outlet Height of 170 mm

Usable with low condensate outlet heat exchangers (Min. Filling Head: 155 mm)

### No Exhaust Pipe Required / Simplified Piping

- Only motive medium intake pipe required - no exhaust pipe necessary\*
- Inlet/outlet piping is linear, streamlined and efficient allowing for easy replacement of existing steam trap
- Built-in air vent and check valves reduce external installation



Installation Example for Existing Mechanical Pump\*

# Advanced Technology in a Compact Body

### Suitable for Equipment with Low Condensate Outlets

The newly developed high performance snap-action unit allows for a low filling head

### Highly Durable for a Long Service Life

The highly durable specialized bearing greatly extends the service life of moving parts



### Stable and Reliable Operation

Newly developed integrated motive intake and exhaust valve unit ensures stable operation and reliability.

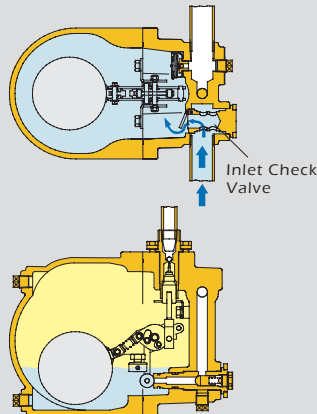




# Operation

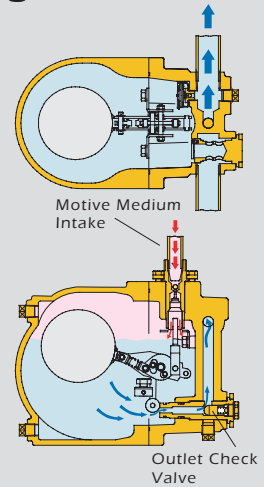
## Condensate Inflow

**1** When condensate flows from the condensate inlet pipe through the inlet check valve into the body of the unit, the float rises and the main valve of the trap unit is open. When the inlet pressure is greater than the back pressure, the condensate passes through the outlet check valve and is discharged through the condensate outlet pipe (normal trapping function). When the back pressure is greater than the inlet pressure, the condensate is not discharged and collects in the body of the unit.

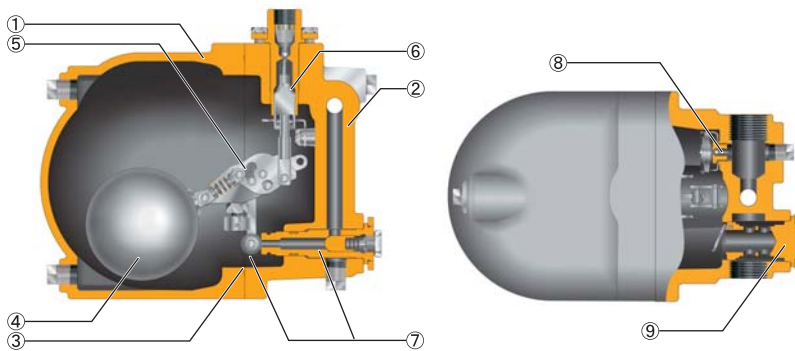


## Condensate Discharge

**2** When the float rises to its highest level, the push rod on the snap-action unit rises quickly, simultaneously closing the exhaust valve and opening the intake (motive medium) valve. The pressure supplied by the motive medium causes the internal pressure in the unit to become greater than the back pressure. The inlet check valve closes and the outlet check valve is pushed open, thus discharging the condensate in the unit through the outlet pipe.



# Configuration and Specifications



## Material

①	Body	Cast Iron, Stainless Steel
②	Cover	Cast Iron, Stainless Steel
③	Cover Gasket	Fluorine Resin
④	Float	Stainless Steel
⑤	Snap-action Unit	Stainless Steel
⑥	Intake / Exhaust Valve Unit	Stainless Steel
⑦	Trap Unit (with Outlet Check Valve)	Stainless Steel
⑧	Air Vent Unit	Stainless Steel
⑨	Inlet Check Valve	Stainless Steel

## Specifications

Connection	Pumped Medium Inlet / Outlet	Screwed
	Motive Medium & Pump Exhaust	Screwed
Size	Pumped Medium Inlet / Outlet	25 / 25mm
	Motive Medium Inlet	15mm
	Pump Exhaust Outlet	10mm
	Max. Operating Pressure PMO	0.5 MPaG
	Max. Operating Temperature TMO	185 °C
	Motive Medium Pressure Range	0.03 - 0.5 MPaG
	Maximum Allowable Back Pressure	0.05 MPa less than motive medium pressure used
	Volume of Each Discharge Cycle	approx. 1.4ℓ
	Motive Medium	Saturated steam
	Pumped Medium	Steam condensate

1 MPa = 10.197 kg/cm<sup>2</sup>

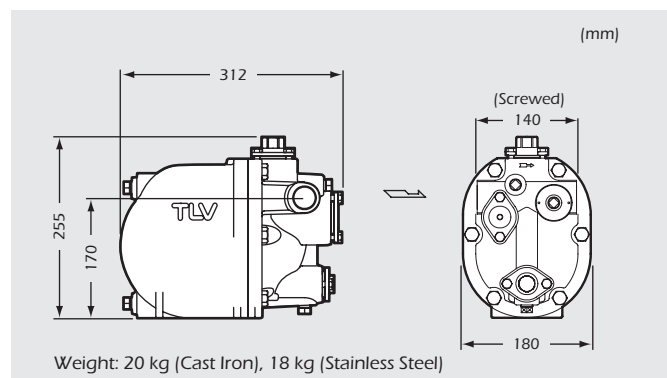
PRESSURE SHELL DESIGN CONDITIONS (NOT OPERATING CONDITIONS):

Maximum Allowable Pressure (MPaG) PMA: 1.0

Maximum Allowable Temperature (°C) TMA: 220

Note: Condensate discharge capacity is shown on the GT5C product specifications data sheet (SDS)

## Dimensions



**CAUTION** To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside the specification range. Local regulations may restrict this product below the conditions quoted.

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is approved by LRQA Ltd. to ISO 9001/14001

ISO 9001/ISO 14001

