

AUTOMATIC PUMP TRAP APST

DESCRIPTION

The ADCAMat APST automatic pump trap is specially recommended where stall condition may occur due to poor steam trap condensate discharge capacity, caused by temporary insufficient pressure drop.

The equipment combines the features of a float steam trap and a pressure operated pump, in one single unit.

Whenever the steam trap function is incapable of draining condensate, the pump function is activated (using external steam pressure). The pump replaces the necessary positive pressure to lift the condensate to the return system, before water logging occurs, avoiding water hammer and consequent noise, equipment damage, corrosion, unstable temperature control, etc.



MAIN FEATURES

No electric requirements.

No NPSH issues.

Operation under vacuum conditions.

No motive or flash steam is lost.

Low filling head for minimal installation space requirements.



OPTIONS: Level gauge.

USE: Drain and lift condensate from heat exchangers (among others).

AVAILABLE MODELS:

APSTS – carbon steel.

APSTS-HC – carbon steel, high capacity.

APSTSS – stainless steel.

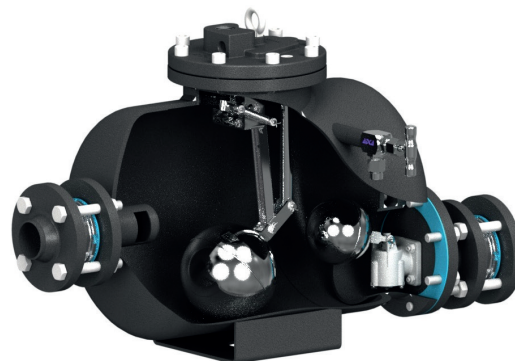
APSTSS-HC – stainless steel, high capacity.

SIZES: 2" x 2" and 3" x 2".
DN 50 x 50 and DN 80 x 50.

CONNECTIONS: Flanged EN 1092-1 PN 16.
Flanged ASME B16.5 Class 150.
Female threaded ISO 7 Rp (threaded flanges).
Others on request.

INSTALLATION: Horizontal installation in a closed loop system.
See IMI – Installation and maintenance instructions.

MOTIVE GAS: Steam.



CE MARKING – GROUP 2 (PED – European Directive)

| PN 16 | Category |
|-----------|---------------|
| All sizes | 2 (CE marked) |

OPERATING LIMITING CONDITIONS

| | |
|------------------------------------|-----------|
| Minimum density | 0,80 kg/L |
| Maximum motive pressure | 10 bar |
| Minimum motive pressure | 1 bar |
| Pump discharge per cycle (approx.) | 22 L |

Remark: It is recommended that the motive pressure does not exceed 1 to 4 bar above the expected back pressure applied to the pump.

**FLOW RATE CAPACITY (kg/h)
OPERATING IN PUMP MODE W/ 300 mm FILLING HEAD**

| MOTIVE PRESSURE (bar) | TOTAL LIFT (bar) | 2" x 2" DN 50 x 50 | 3" x 2" DN 80 x 50 | |
|-----------------------|------------------|--------------------|--------------------|------|
| 1 | 0,35 | 2290 | 2640 | |
| 2 | | 3130 | 3610 | |
| 3 | | 3530 | 4070 | |
| 4 | | 3810 | 4390 | |
| 6 | | 3910 | 4500 | |
| 8 | | 3960 | 4570 | |
| 10 | | 3970 | 4580 | |
| 2 | 1 | 2520 | 2910 | |
| 3 | | 2960 | 3420 | |
| 4 | | 3130 | 3610 | |
| 6 | | 3220 | 3710 | |
| 8 | | 3250 | 3750 | |
| 10 | | 3290 | 3800 | |
| 3 | 2 | 2440 | 2810 | |
| 4 | | 2590 | 2990 | |
| 5 | | 2800 | 3220 | |
| 6 | | 2830 | 3270 | |
| 8 | | 2850 | 3290 | |
| 10 | | 2870 | 3300 | |
| 4 | 3 | 2330 | 2680 | |
| 5 | | 2510 | 2900 | |
| 6 | | 2530 | 2920 | |
| 8 | | 2560 | 2960 | |
| 10 | | 2620 | 3030 | |
| 5 | | 4 | 2250 | 2600 |
| 6 | 2430 | | 2810 | |
| 8 | 2470 | | 2860 | |
| 10 | 2510 | | 3010 | |
| 6 | 5 | | 2050 | 2370 |
| 8 | | | 2150 | 2490 |
| 10 | | 2190 | 2540 | |
| 7 | | 6 | 1850 | 2140 |
| 8 | | | 1910 | 2210 |
| 10 | | | 2120 | 2450 |

BODY LIMITING CONDITIONS *

| APSTS | | APSTSS | |
|--------------------|---------------------|--------------------|---------------------|
| PN 16 / CLASS 150 | | PN 16 / CLASS 150 | |
| ALLOWABLE PRESSURE | RELATED TEMPERATURE | ALLOWABLE PRESSURE | RELATED TEMPERATURE |
| 16 bar | 50 °C | 16 bar | 50 °C |
| 14 bar | 100 °C | 15 bar | 100 °C |
| 13 bar | 195 °C | 12,7 bar | 200 °C |
| 12 bar | 250 °C | 12 bar | 250 °C |

Min. operating temp.: -10 °C; Design code: AD-Merkblatt.
* Rating according to EN 1092-1:2018.

**RESERVOIR SIZING TABLE
FOR EQUALIZED, CLOSED SYSTEM INSTALLATION**

| FLOW RATE (kg/h) | RESERVOIR SIZE (DN) | | | | | | |
|------------------|-----------------------|------|------|------|------|------|------|
| | 40 | 50 | 80 | 100 | 150 | 200 | 250 |
| | RESERVOIR LENGTH (mm) | | | | | | |
| ≤ 300 | 1200 | 700 | - | - | - | - | - |
| 400 | 1500 | 1000 | - | - | - | - | - |
| 500 | 2000 | 1200 | 500 | - | - | - | - |
| 600 | - | 1500 | 600 | - | - | - | - |
| 800 | - | 2000 | 800 | 500 | - | - | - |
| 1000 | - | - | 1000 | 700 | - | - | - |
| 1500 | - | - | 1500 | 1000 | - | - | - |
| 2000 | - | - | 2000 | 1300 | 600 | - | - |
| 3000 | - | - | - | 2000 | 900 | 500 | - |
| 4000 | - | - | - | - | 1200 | 700 | - |
| 5000 | - | - | - | - | 1400 | 800 | 500 |
| 6000 | - | - | - | - | 1700 | 1000 | 600 |
| 7000 | - | - | - | - | 2000 | 1200 | 700 |
| 8000 | - | - | - | - | - | 1300 | 800 |
| 9000 | - | - | - | - | - | 1500 | 900 |
| 10000 | - | - | - | - | - | 1700 | 1000 |

Remark: Reservoir length can be reduced by 50% when the motive pressure divided by the back pressure is ≥ 2.

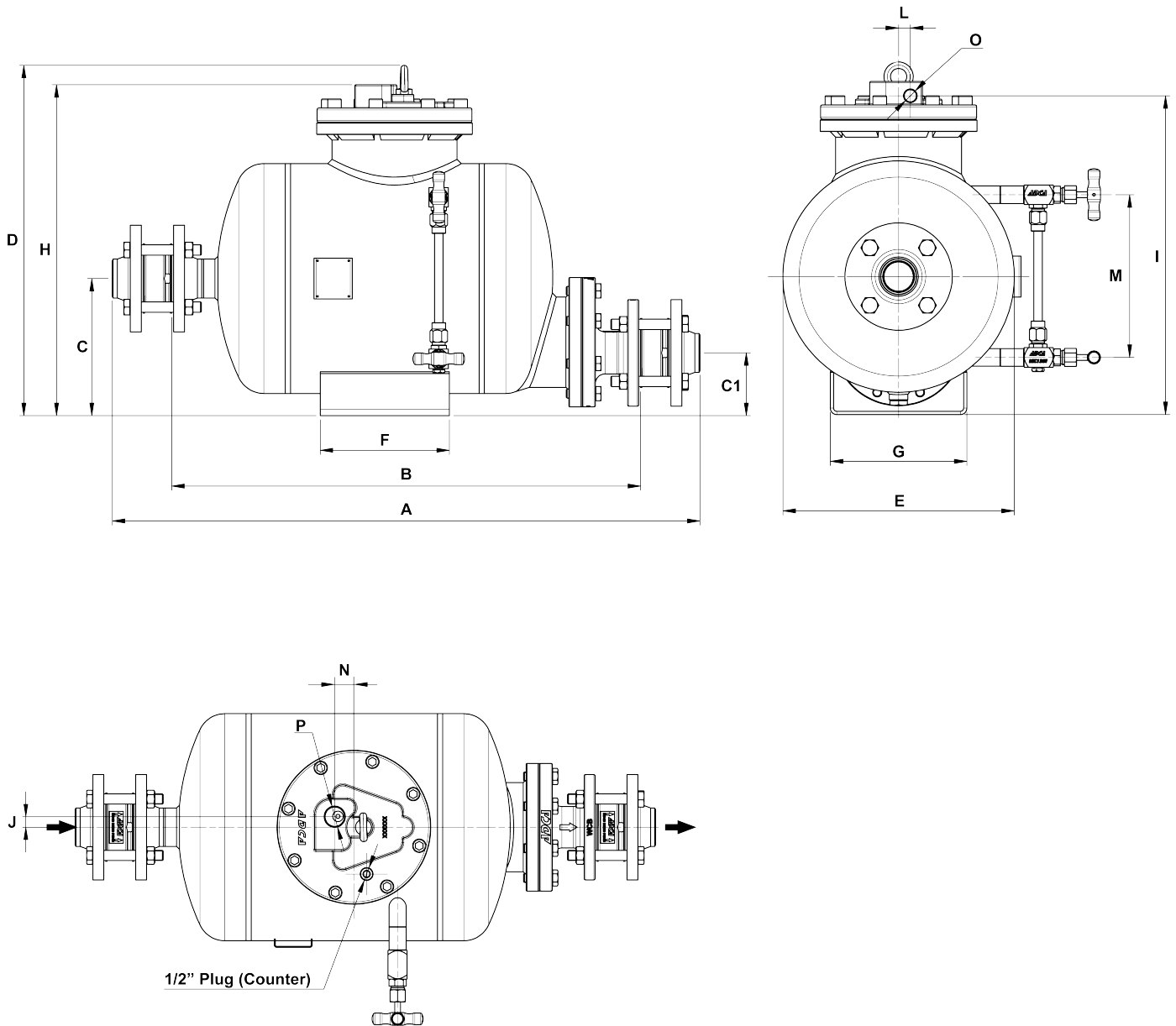
**CAPACITY MULTIPLYING FACTORS
FOR OTHER FILLING HEADS**

| PUMP SIZE | FILLING HEAD "H" (mm) | | | |
|-----------|-----------------------|-----|-----|------|
| | 150 | 300 | 600 | 900 |
| All sizes | 0,7 | 1 | 1,2 | 1,35 |

Remark: Filling head "H" is shown in Fig. 1.

FLOW RATE CAPACITY (kg/h) OPERATING IN STEAM TRAP MODE

| MODEL | SIZE | DIFFERENTIAL PRESSURE (bar) | | | | | | | | | |
|---------|----------------------|-----------------------------|------|------|------|-------|-------|-------|-------|-------|-------|
| | | 0,1 | 0,3 | 0,5 | 0,7 | 1 | 1,5 | 2 | 4,5 | 7 | 10 |
| APST | 2" x 2" - DN 50 x 50 | 1800 | 3000 | 3900 | 4450 | 5000 | 6100 | 7100 | 10000 | 13750 | 16000 |
| APST-HC | 2" x 2" - DN 50 x 50 | 2400 | 5900 | 7550 | 9050 | 11000 | 14000 | 15500 | 22500 | 26500 | 30000 |
| APST | 3" x 2" - DN 80 x 50 | 1800 | 3000 | 3900 | 4450 | 5000 | 6100 | 7100 | 10000 | 13750 | 16000 |
| APST-HC | 3" x 2" - DN 80 x 50 | 2400 | 5900 | 7550 | 9050 | 11000 | 14000 | 15500 | 22500 | 26500 | 30000 |



DIMENSIONS (mm) – PN 16

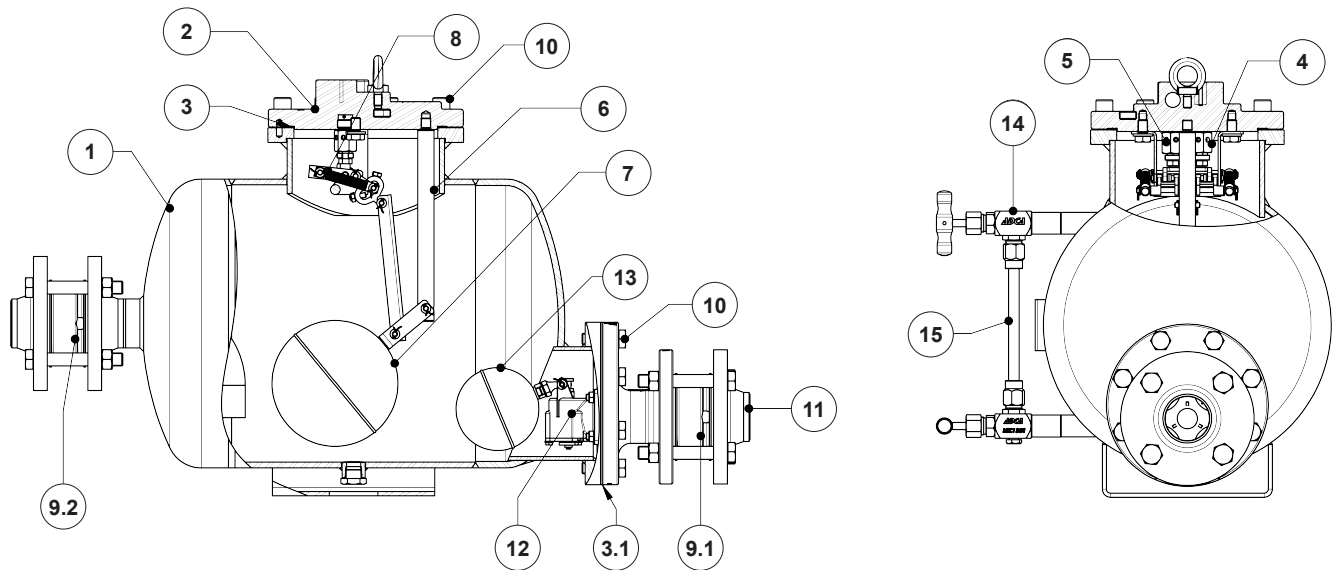
| SIZE | A * | B * | C | C1 | D | E | F | G | H | I | J | L | M | N | O ** | P ** | WGT. (kg) | VOL. (L) |
|------------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|----|----|-----|----|------|------|-----------|----------|
| DN 50 x 50 | 910 | 726 | 212 | 97 | 542 | 356 | 200 | 210 | 512 | 490 | 17 | 18 | 250 | 30 | 1/2" | 1" | 84 | 45 |
| DN 80 x 50 | 924 | 728 | 212 | 97 | 542 | 356 | 200 | 210 | 512 | 490 | 17 | 18 | 250 | 30 | 1/2" | 1" | 91 | 45 |

DIMENSIONS (mm) – CLASS 150

| SIZE | A * | B * | C | C1 | D | E | F | G | H | I | J | L | M | N | O ** | P ** | WGT. (kg) | VOL. (L) |
|---------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|----|----|-----|----|------|------|-----------|----------|
| 2" x 2" | 958 | 743 | 212 | 97 | 542 | 356 | 200 | 210 | 512 | 490 | 16 | 18 | 250 | 30 | 1/2" | 1" | 86 | 45 |
| 3" x 2" | 980 | 748 | 212 | 97 | 542 | 356 | 200 | 210 | 512 | 490 | 16 | 18 | 250 | 30 | 1/2" | 1" | 90 | 45 |

* Dimensions are different if threaded flanges are requested;

** As standard, in versions manufactured with EN 1092-1 PN 16 flanges, these connections are female threaded ISO 7 Rp. In versions with ASME B16.5 flanges, these connections are female threaded NPT.



MATERIALS

| POS. N° | DESIGNATION | APSTS | APSTSS |
|---------|---------------------------------|--|--|
| 1 | Body | P265GH / 1.0425 ; P235GH / 1.0345 ; S235JR / 1.0038 | AISI 316 / 1.4401; AISI 316L / 1.4404 |
| 2 | Cover | GJS-400-15 / 0.7040 | A351 CF8M / 1.4408 |
| 3 | * Cover gasket | Non asbestos | Non asbestos |
| 3.1 | * Outlet cover gasket | Non asbestos | Non asbestos |
| 4 | * Inlet valve / Seat assembly | Stainless steel | Stainless steel |
| 5 | * Exhaust valve / Seat assembly | Stainless steel | Stainless steel |
| 6 | Pump mechanism | Stainless steel | Stainless steel |
| 7 | *Float | Stainless steel | Stainless steel |
| 8 | * Spring assembly (2 pieces) | Inconel | Inconel |
| 9.1 | * RD40 outlet check valve | A351 CF8M / 1.4408 | A351 CF8M / 1.4408 |
| 9.2 | * RD40 Inlet check valve | A351 CF8M / 1.4408 | A351 CF8M / 1.4408 |
| 10 | Bolts | Steel 8.8 | Stainless steel A2-70 |
| 11 | ** PN 16 EN 1092-1 flanges | P250GH / 1.0460 | AISI 316 / 1.4401 |
| 12 | * Steam trap unit | Stainless steel | Stainless steel |
| 13 | * Steam trap float | Stainless steel | Stainless steel |
| 14 | Level gauge cocks | Bronze / Stainless steel | Stainless steel |
| 15 | Tube glass | Borosilicate | Borosilicate |

* Available spare parts.

** Welding neck EN 1092-1:2018 flanges.

SIZING AND INSTALLATION

SIZING

To accurately size a pump trap, the following information must be provided:

1. Heat exchanger (or process equipment) maximum steam or condensate load, in kg/h.
2. Heat exchanger (or process equipment) operating pressure at full load in bar g or, alternatively, the heat exchanger maximum operating pressure in bar g and the over design percentage.
3. Motive steam pressure available to operate the pump trap, in bar g.
4. The total lift or back pressure the pump will have to overcome. This includes the change in the fluid level elevation after the pump (0,0981 bar/m of lift), plus pressure in the returning pipe, plus the pressure drop caused by pipe friction, plus any other system component pressure drop the pump will have to overcome, in bar g.
5. Maximum controlled temperature of the medium to be heated (secondary fluid outlet temperature), in °C.
6. Minimum temperature of the medium to be heated (secondary fluid minimum inlet temperature), in °C.
7. Installation head available "H" (see Fig. 1) in mm or any other dimension that allows its determination.

For information on how to predict stall refer to IS 9.085 Technical Information Sheet - Understanding stall condition - or consult the manufacturer.

RESERVOIR

A reservoir is recommended to temporarily hold the liquid and prevent any flooding of the equipment, while the pump is performing a pumping cycle. A length of pipe of large diameter can be used (see reservoir sizing table).

NOTE: All ADCAMat automatic pump traps feature two mechanisms, combining the characteristics of a float steam trap and a pressure operated pump.

When certain that the system backpressure is always superior to the equipment upstream pressure then an ADCAMat pressure operated pump (without steam trap) is the ideal solution as long as it is installed in a closed loop.

In extreme cases, where the system condensate load is above the discharge capacity of all ADCAMat automatic pump trap models, it is recommended to install an ADCAMat pressure operated pump in combination with a high capacity FLT series steam trap. In these scenarios, please consult manufacturer.

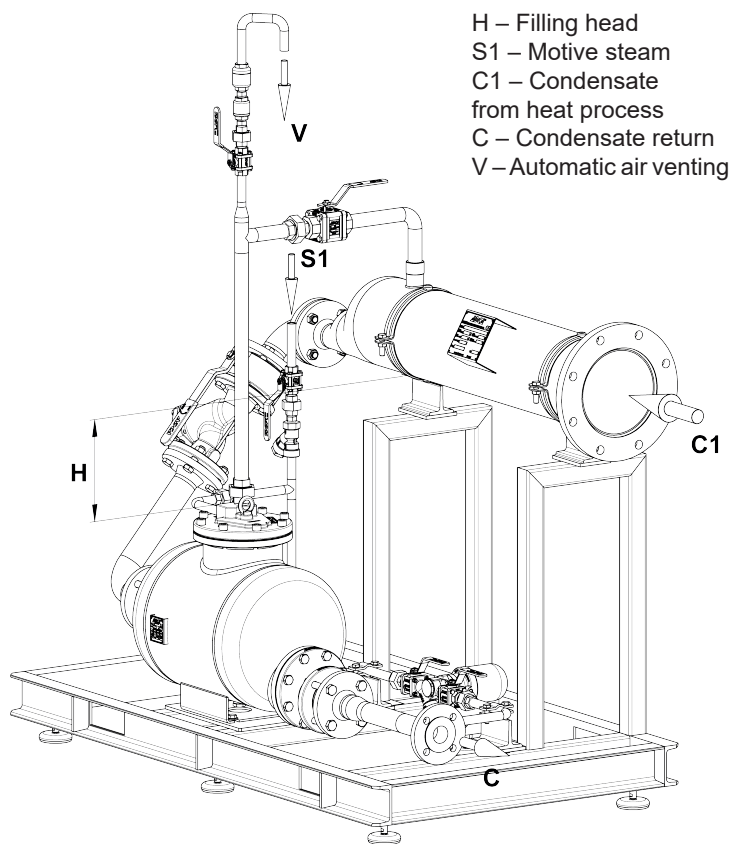
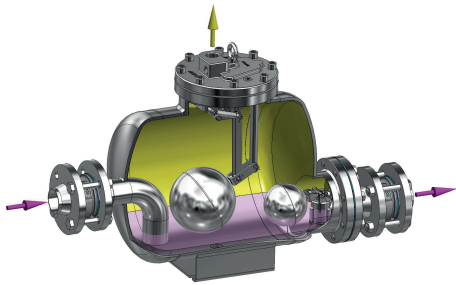
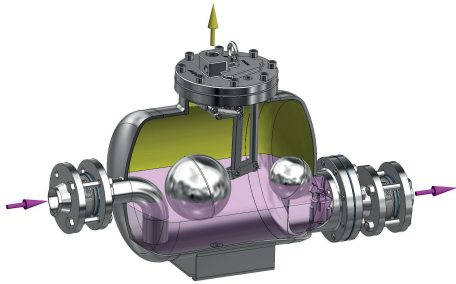


Fig.1

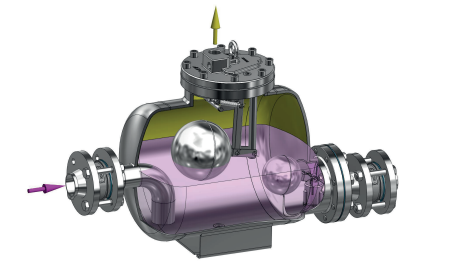
OPERATION



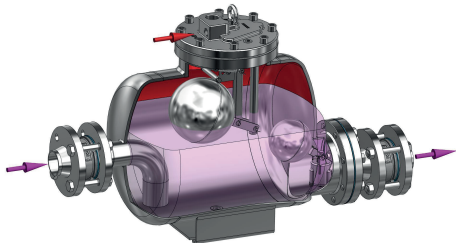
1. In the first instance, the steam intake valve is closed, while the vent valve is open. As condensate flows into the body through the inlet check valve, the APST can operate in a closed loop application, in one of two ways (as a steam trap or pressure operated pump).



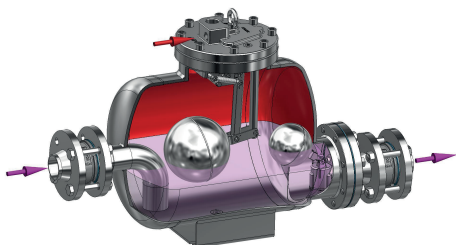
2. If the inlet pressure is greater than the back pressure, the APST works as a steam trap, continuously discharging condensate by differential pressure. At this point the steam intake valve remains closed and the vent valve open.



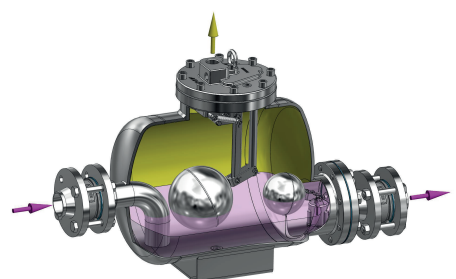
3. As soon as, e.g., the equipment's control valve starts to modulate, the steam pressure will decrease. The lower differential pressure decreases the APST's ability to discharge as a steam trap, causing the condensate level to rise inside the body. Vacuum may even occur at this stage.



4. If this situation would persist, the condensate would eventually flood the equipment, causing problems. However, by using an APST, as the float reaches its highest position, the snap action mechanism actuates, closing the vent valve and opening the steam intake valve. Steam will then replace the necessary positive pressure to pump out the condensate. At this point the APST works as a pressure operated pump.



5. The float starts to fall as the condensate level inside the body drops and is discharged to the return system. When the float reaches its lowest position, the snap action mechanism resets.



6. As the motive steam valve closes and the vent valve opens, equalizing the body pressure with the upstream pressure, the condensate is allowed to flow once again into the APST. The cycle then repeats itself and, with enough differential pressure, the APST resumes as a steam trap or, otherwise, as a pump.