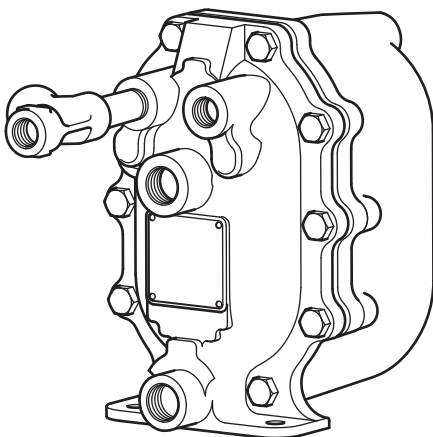


APT10-4.5

Automatic Pump Trap

Installation and Maintenance Instructions



1. General safety information
2. Product information
3. Installation
 - Closed loop steam systems only
4. Commissioning
5. Operation
6. Maintenance
7. Replacement of spares (1):
 - Cover gasket
 - Inlet swing check valve
 - Spring and actuator arm
 - Float
8. Replacement of spares (2):
 - Trap and outlet check valve mechanism
 - Steam inlet / exhaust valves and seats
9. Fault finding guide

1. General safety information

Safe operation of this Spirax Sarco product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

1.1 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application.

- i) Check material suitability, pressure and temperature and the maximum and minimum values. If the maximum operating limit of the product is lower than the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- ii) Determine the correct installation situation and direction of fluid flow.
- iii) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.
- iv) Remove protection covers from all connections before installation.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?

Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions. Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety. Post 'warning notices' if necessary.

1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.13 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of these products may reach temperatures of 200 °C (392 °F).

These products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Safety information - Product specific

See the relevant Section in the attached Installation and Maintenance Instruction for specific details relating to the weight and internal mechanism of these products.

1.16 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.17 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2. Product information

2.1 Description

The Spirax Sarco APT10-4.5 automatic pump trap is a displacement receiver pressure rated to PN10, available with standard blue paint finish or coated in ENP (Electroless Nickel Plate). The unit is capable of automatically trapping or pumping, depending on line conditions. The unit is operated by steam and is used to remove condensate from process and heating plant under all pressure conditions including vacuum.

2.2 Sizes and pipe connections

Size		DN20 x DN20	
Fluid connections			
Inlet	Outlet	Motive/Exhaust	
DN20 (¾")	DN20 (¾")	DN15 (½")	
BSP - BS 21 parallel		BSP	
NPT		NPT	

2.3 Limiting conditions

Body design conditions		PN10	
Maximum motive inlet pressure	4.5 bar g	(65 psi g)	
Maximum operating pressure	4.5 bar g	(65 psi g)	
Maximum backpressure	4.0 bar g	(58 psi g)	
Maximum operating temperature	155 °C	(311 °F)	
Minimum operating temperature	-10 °C	(14 °F)	
Temperature limits (Ambient)	-10 °C to 200 °C (14 °F to 392 °F)		
Designed for a maximum cold hydraulic test pressure of:	15.0 bar g	(217 psi g)	
Minimum installation head (from base of pump)	0.2 m	(8")	
Recommended installation head (from base of pump)	0.3 m	(12")	

2.4 Technical specification - Nominal capacities

For full capacity details for a specific application consult Spirax Sarco. To accurately size the pump trap, the following data is required.

1. Installation head available, from the base of the pump trap to the centre line of the heat exchanger / process condensate outlet (m).
If the outlet is mounted vertically, then this should be from the base of the pump to the face of the outlet.
2. Motive steam pressure available to power the pump trap (bar g).
3. Total backpressure in the condensate return system (bar g).
See note below.
4. Heat exchanger full load operating pressure (bar g).
5. Heat exchanger maximum steam load (kg/h).
6. Minimum temperature of secondary fluid (°C).
7. Maximum controlled temperature of secondary fluid (°C).

Note:

Total lift or backpressure BP (static head plus pressure head in the return system) must be below the motive fluid inlet pressure to allow pump capacity to be achieved.

$$BP \text{ (backpressure)} = (H \times 0.098 \text{ 1}) + (P) + (Pf)$$

Height (H) in metres x 0.098 1 plus pressure (P) bar g in the return line, plus downstream piping friction pressure drop (Pf) in bar.

(Pf can be ignored if the downstream pipework is less than 100 metres to a non-flooded condensate return and has been sized to take into account the effect of flash steam at the heat exchanger's full load operating conditions.)

Size	DN20 x DN20
Pump discharge/cycle	2.6 litres
At: 1.0 metre installation head 4.5 bar g motive pressure 2.5 bar g total backpressure	Max. trapping capacity 830 kg/h
	Max. pumping capacity 650 kg/h

2.5 How to order

Example: 1 off Spirax Sarco APT10-4.5 automatic pump trap having screwed DN20 x DN20 BSP connections and BSP motive fluid connections.

2.6 Dimensions/weight (approximate) in mm and kg

Size	A	B	C	D	E	F	G	H	I	Weight
DN20 x DN20	187	23	223	398	273	220	57	135	171	14

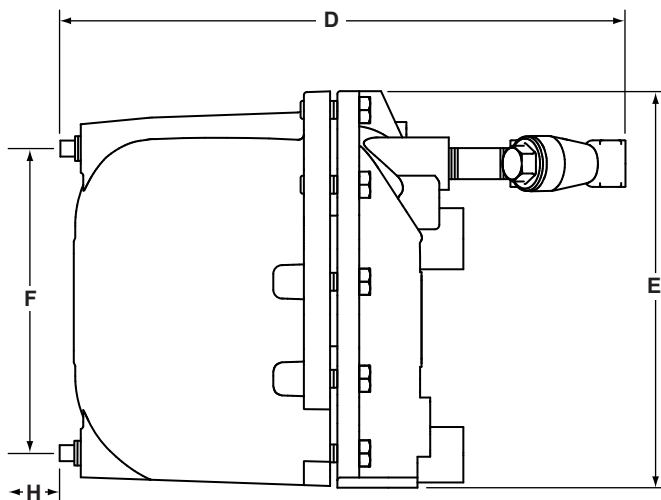


Fig. 1

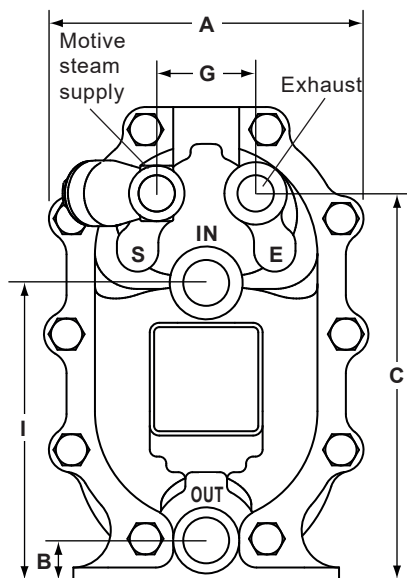


Fig. 2

2.7 Materials

No.	Part	Material	
1	Cover	SG iron	EN JS 1025 / ASTM A395
2	Cover gasket	Synthetic fibre	
3	Body	SG iron	EN JS 1025 / ASTM A395
4	Cover bolts	Stainless steel	BS EN ISO 3506 Gr. A2-70
5	Pump trap lever	Stainless steel	BS 1449 304 S15
6	Float	Stainless steel	BS 1449 304 S16
7	Pivot shaft	Stainless steel	BS 970 431 S29 ASTM A276 431
8	Washer	Stainless steel	BS 1449 316
9	Trap housing	Stainless steel	BS 970 431 S29 ASTM A276 431
10	Ball	Stainless steel	ASTM A276 440 B
11	Seat (inlet check valve)	Stainless steel	AISI 420
12	Flap (inlet check valve)	Stainless steel	BS 3146 ANC 4B
13	Pump mechanism bracket	Stainless steel	BS 3146 ANC 4B
14	Spring (pump)	Stainless steel	BS 2056 302 S26 Gr.2
15	Split pin	Stainless steel	BS 1574
16	Exhaust seat	Stainless steel	BS 970 431 S29 / ASTM A276 431
17	Inlet valve and seat assembly	Stainless steel	ASTM A276 440 B / BS 970 431 S29
18	Exhaust valve	Stainless steel	BS 3146 ANC 2
19	Valve seat gasket	Stainless steel	BS 1449 409 S19
20	Pump mechanism bolt	Stainless steel	BS EN ISO 3506 Gr. A2-70
21	Float bolt	Stainless steel	BS EN ISO 3506 Gr. A2-70
22	Trap 1st stage valve	Stainless steel	BS 970 431 S29 / ASTM A276 431
23	Trap gasket	Stainless steel	BS 1449 409 S19
24	Actuator arm	Stainless steel	BS 3146 ANC 2
25	Name-plate	Stainless steel	BS 1449 304 S16
26	Drain plug	Stainless steel	DIN 17440 1.4571
27	Motive supply strainer	SG iron	DIN 17440 1.4571

Disposal

There are no hazardous materials used in the construction of this product. Any unwanted material should be recycled or disposed of in an environmentally friendly manner.

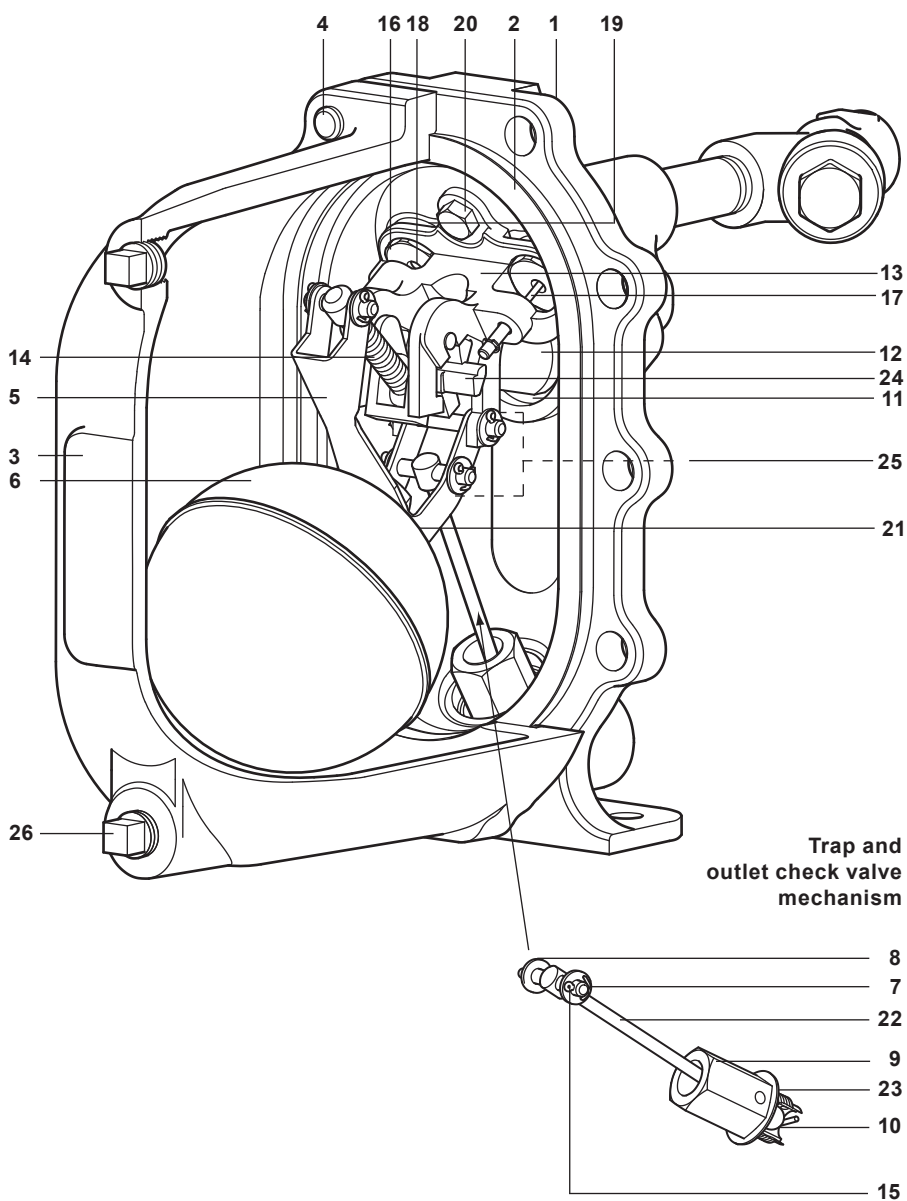


Fig. 3

3. Installation

Important - safety note

Before any installation or maintenance procedure, always ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved and any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work. Always use suitable lifting gear and ensure the product is safely secured.

Note: If pumping a potentially explosive media, the motive supply media must be an inert gas with no oxygen present.

3.1 Inlet piping

To prevent condensate backing up into the equipment being drained, it is recommended that the inlet pipework is sufficiently sized to accumulate condensate during the pump's discharge cycle. Generally a length and diameter of pipe to accommodate 2.1 litres of condensate will be sufficient. It is recommended this condensate reservoir is situated at least 1 pipe diameter below the process outlet but as high as possible above the APT10-4.5 inlet. It is essential that a Spirax Sarco Y-type strainer with a maximum 0.8 mm perforation screen size is fitted at the condensate inlet of the APT10-4.5, as shown in Fig. 5.

3.2 Recommended installation head

An installation head of at least 0.3 m (12 ins) from the base of the unit is recommended. Minimum 0.2 m (8 ins) with reduced capacity. **Note:** During cold start-up conditions, it is possible for hydraulic pulsing of the inlet check valve to occur. It is advisable in this case to install a throttling isolation valve to reduce the filling pressure.

3.3 Connections (refer to installation diagram Fig. 4 opposite)

The APT10-4.5 has four connection ports. The DN20 (¾") port marked (IN) should be connected to the outlet of the equipment being drained. The DN20 (¾") port marked (OUT) should be connected to the condensate return line. A flow arrow indicates the correct direction of flow. The DN15 (½") port marked (S) - steam should be connected to a trapped motive steam supply. * It is important to ensure this line is drained of condensate at all times using a Spirax Sarco steam trap and filtered using the 100 mesh strainer supplied fitted to the pump trap, (see Fig. 5). The screwed DN15 (½") port marked (E) - exhaust should be balanced back as close as possible to the condensate outlet of the equipment. This balance line must always be connected to the top of the condensate pipe; as shown in Fig. 5.

Note: The APT10-4.5 can be secured to a level stable surface using the 2 x Ø12 mm holes drilled into the base of the cover.

3.4 Outlet piping

It is important for the outlet piping to be correctly sized to prevent excessive backpressure on the APT10-4.5. This pipework should be sized to take into account the effects of flash steam at the heat exchangers full load operating conditions.

4. Commissioning

4.1 After ensuring inlet and outlet pipe connections and steam motive/exhaust connections are coupled in accordance with Fig.4 and 5, slowly open motive steam inlet line to supply pressure to the APT10-4.5. Ensure exhaust/balance line is open and not restricted in any way.

4.2 Slowly open the isolation valves in the condensate inlet and discharge lines, allowing condensate to fill the body of the APT10-4.5.

4.3 The APT10-4.5 is now ready to operate.

4.4 When the process plant is operational, the APT10-4.5 will discharge condensate under all pressure conditions into the return line.

4.4 If any irregularities are observed, recheck the installation according to the recommendations. If the unit fails to operate, then consult the fault finding guide Section 9.

Fig. 4 Suggested coupling of motive supply and exhaust lines

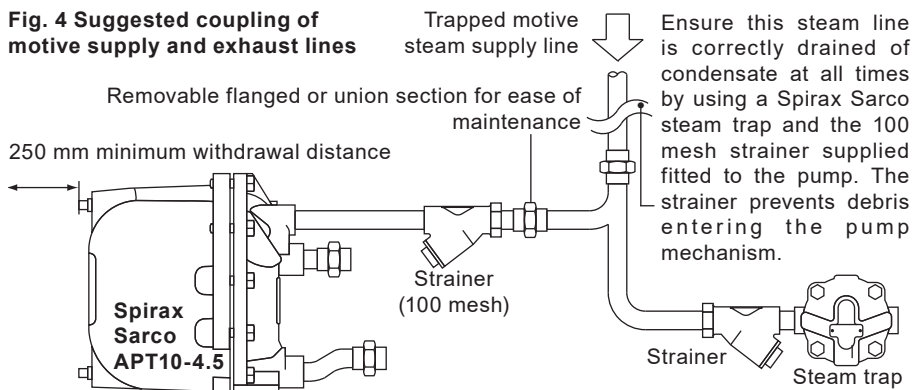
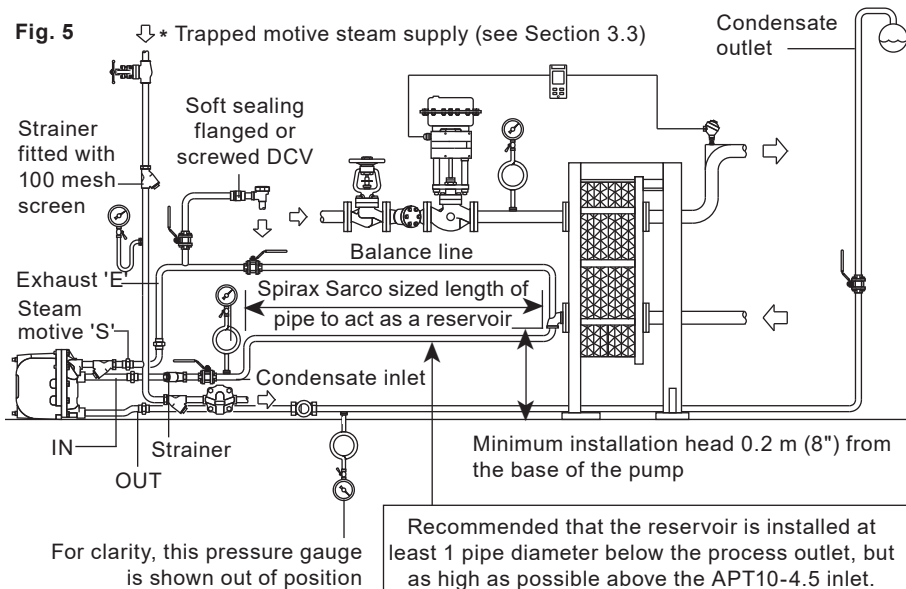


Fig. 5 * Trapped motive steam supply (see Section 3.3)



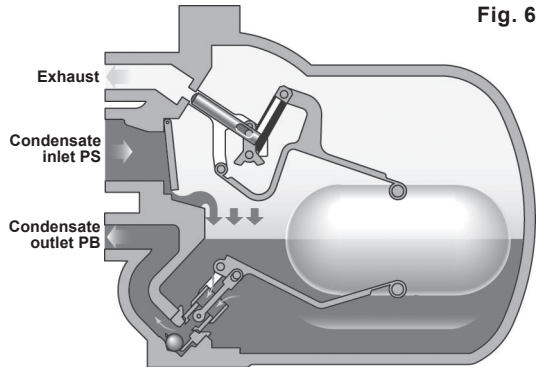
5. Operation

Larger APT14
shown for illustration

Step 1 (Fig. 6)

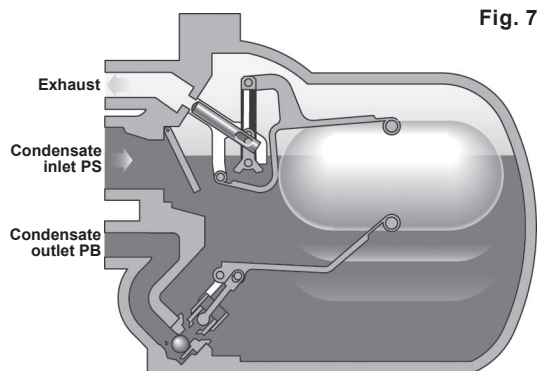
The APT10-4.5 automatic pump trap operates on a positive displacement principle. Condensate enters the body through the inlet swing check valve causing the float to rise. The float is connected to the trap mechanism via a lever to pivot arrangement. If the upstream system pressure PS is sufficient to overcome the backpressure PB (Fig. 6), the build up of condensate will be discharged through the opening trap mechanism.

In this way, the float will automatically modulate according to the rate of condensate entering the APT10-4.5, controlling the rate of opening and closure of the trap.



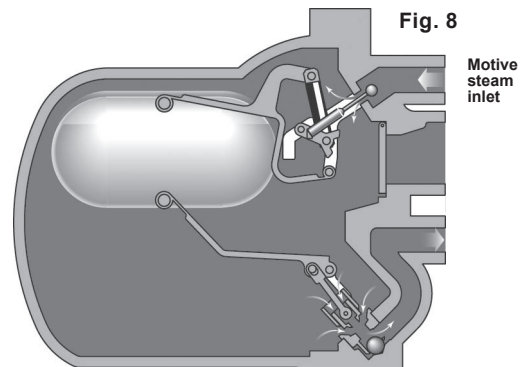
Step 2 (Fig. 7)

With some temperature controlled equipment, it is possible for the system pressure PS to be lower than the backpressure at PB (Fig. 7). If this occurs a standard trap will stall allowing the condensate to flood the equipment being drained.



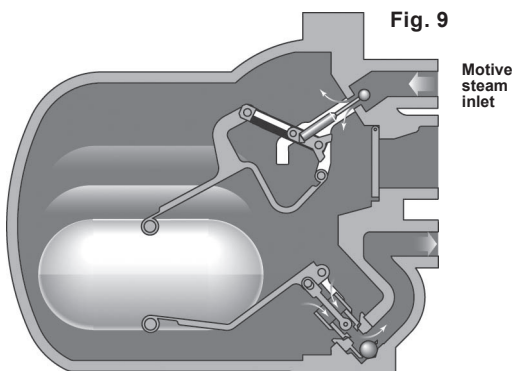
Step 3 (Fig. 8)

However, with the APT10-4.5, the condensate simply fills the main chamber - lifting the float until the changeover linkage is engaged, opening the motive inlet and closing the exhaust valve.



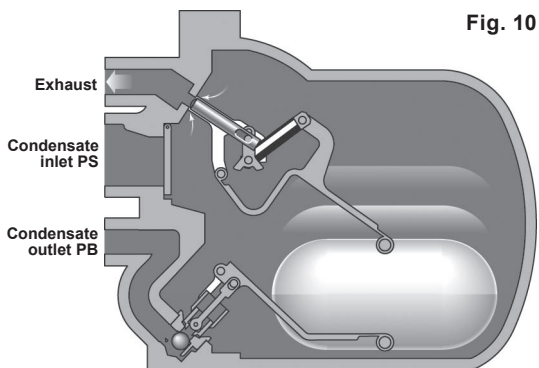
Step 4 (Fig. 9)

The snap action mechanism ensures a rapid change from the trapping mode to the active pumping mode. With the motive inlet valve open, the pressure in the APT10-4.5 increases above the total backpressure and the condensate is forced out through the trap seat into the plant's return system.



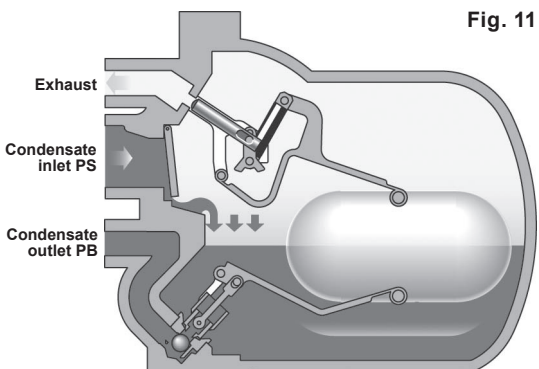
Step 5 (Fig. 10)

As the condensate level falls within the main chamber, the float re-engages the change over linkage, causing the motive inlet to close and the exhaust valve to open.



Step 6 (Fig. 11)

As the pressure inside the APT10-4.5 equalises with the condensate inlet pressure through the open exhaust valve, condensate re-enters via the inlet swing check valve. At the same time the outlet ball check valve ensures no condensate can drain back into the main chamber and the trapping or pumping cycle begins again.



Return to Step 1.

6. Maintenance

6.1 Mechanisms inspection and repair (Important - safety note)

Before any installation or maintenance procedure, always ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism. Always handle with care.

6.2 Removal and fitting of cover assembly

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, Flat blade screw driver, Torque wrench.

6.3 To remove the cover assembly

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the body away from the cover (135 mm [5½"] minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
2. Visually inspect the mechanism for obvious damage. Check that it is free of dirt and scale and operates freely when the float is moved up and down.
3. Inspect the spring assembly for damage. Make sure the valves slide freely and the spring loaded exhaust valve moves on its guide.
4. Inspect the float to ensure it is undamaged. Check it pivots smoothly on the pump trap lever and it is not waterlogged.
5. Ensure the inlet swing check valve is free to move and the sealing faces of both the seat and the flap are clean and undamaged. (If the seat is badly scored or damaged a new cover assembly may be required).
6. Check the integral trap module to ensure the valve is free from dirt and debris.
7. It is not possible to visually check the outlet check valve without removing the trap module (refer to Section 8 of this manual for correct removal and fitting of this part).
8. If any of the parts appear damaged or fail to work correctly, then refer to Sections 7 and 8 of this manual for correct removal and fitting instructions.

6.4 If a new cover assembly is to be fitted

1. Ensure the gasket face in the body is clean and free from debris. Carefully slide the new cover assembly into the existing body, whilst ensuring the new gasket (item 2) is carefully aligned with the gasket faces and no parts of it are trapped or pinched outside the sealing areas.
2. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ±5 N m (46.5 ±4 lbf ft).

Bolt size	Socket size	Tightening torque
M12 x 40	19 mm A/F	63 ±5 N m (46.5 ±4 lbf ft)

3. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT), then follow the start-up procedure in **Section 4 'Commissioning'** to bring the APT10-4.5 back into operation.

6.5 Spare parts

	A Cover gasket	
	B Inlet check valve	
	C Spring and actuator arm	
Available spares	D Float	See page 16
	E Trap and outlet check valve mechanism	
	F Inlet/exhaust valves and seat kit	
	G Motive supply strainer	See separate literature

Note: Refer to Fig. 3 (page 9) for component number details.
For customer convenience, spares are supplied in kits to ensure all the appropriate replacement parts are available.

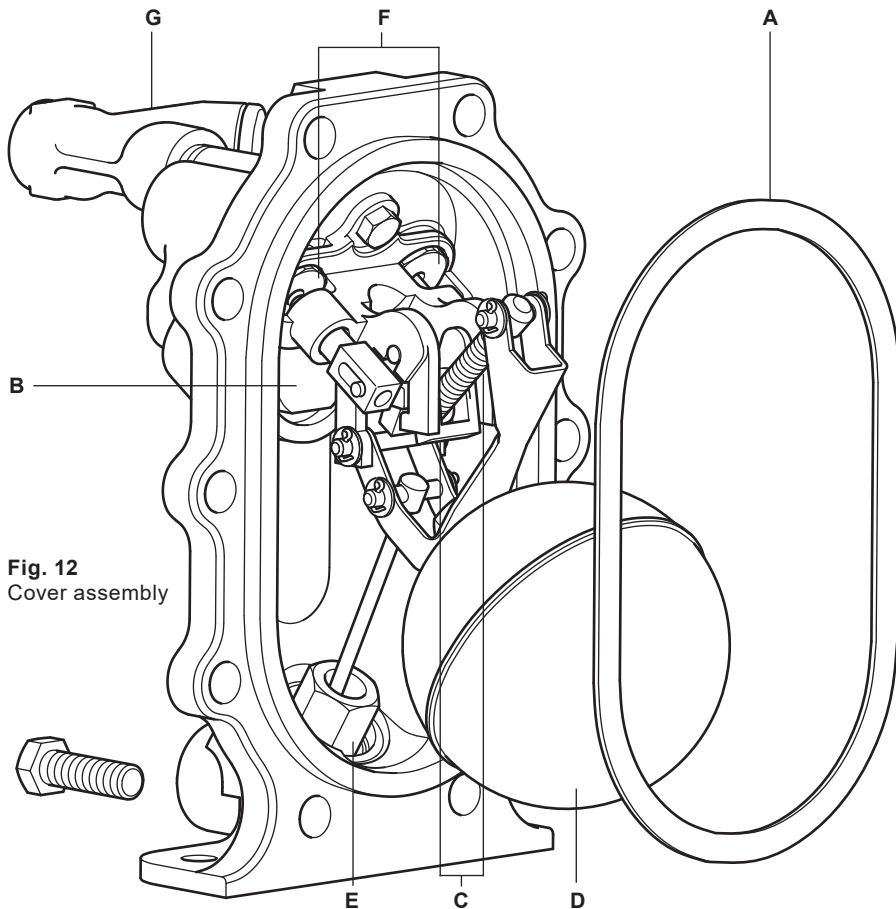


Fig. 12
Cover assembly

6.6 Spare parts

Available spares

A	Cover gasket	2
B	Inlet check valve	2, 12
C	Spring and actuator arm	2, 14, 24
D	Floats	2, 5, 6, 21
E	Trap and outlet check valve mechanism	2, 7, 8, 9, 10, 22, 23
F	Inlet/exhaust valves and seat kit	2, 16, 17, 18, 19

Note: Refer to Fig. 3 (page 9) for component number details.
For customer convenience, spares are supplied in kits to ensure all the appropriate replacement parts are available.

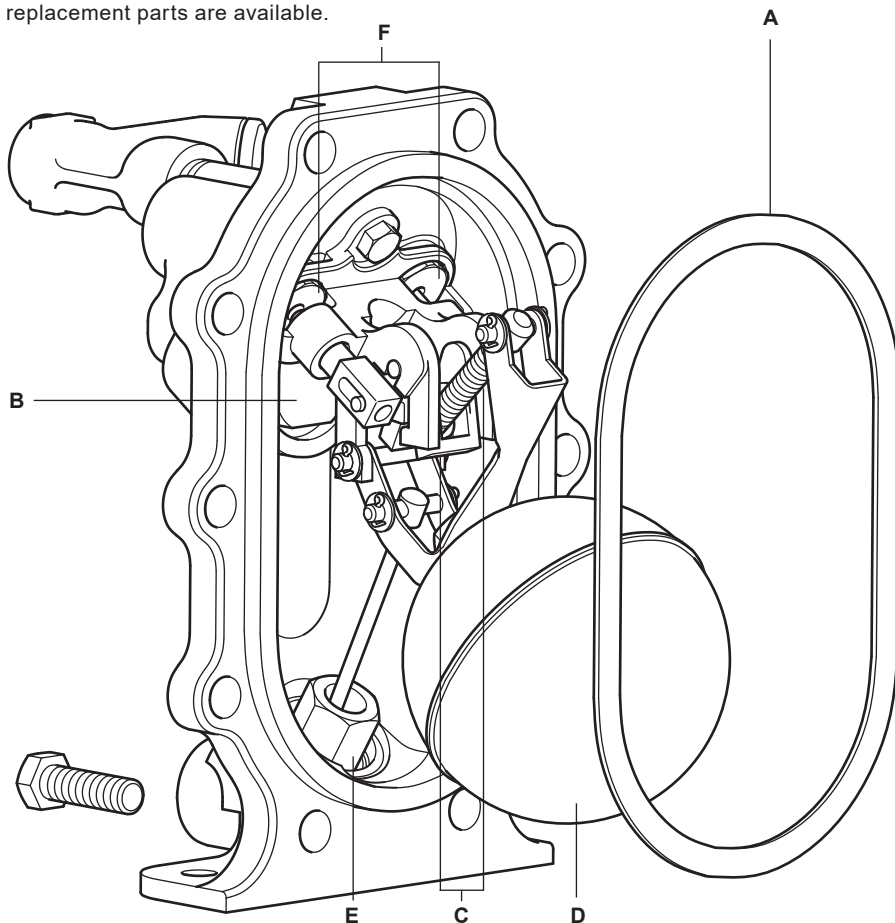
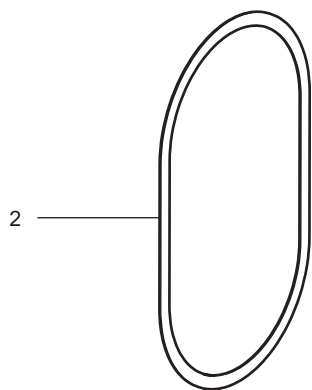
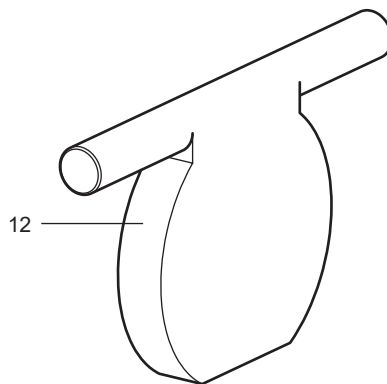


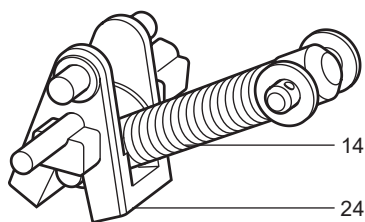
Fig. 13 Cover assembly



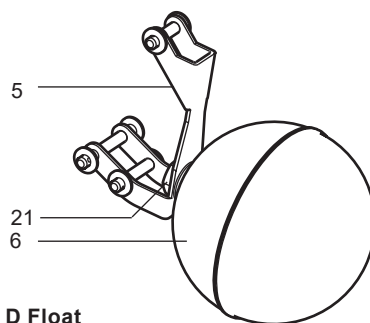
A Cover gasket



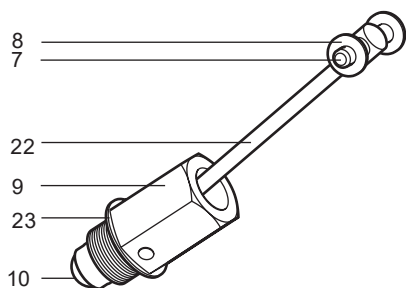
B Inlet check valve



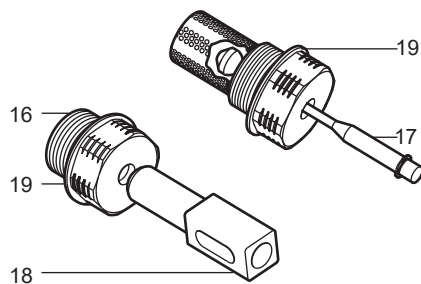
C Spring and actuator arm



D Float



E Trap and outlet check valve mechanism



F Inlet / exhaust valve and seat kit

Fig. 14 A - F Spares kits

7. Replacement of spares (1)

Section 7 covers the replacement of the following spares:- cover gasket, inlet swing check valve, spring and actuator arm and float.

Important - safety note

Before any installation or maintenance procedure, ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism.

Always handle with care.

7.1 Replacement of cover gasket

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, Flat blade screw driver, Torque wrench

To fit the new cover gasket

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the cover assembly away from the body (135 mm [5½"] minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face (See Fig. 15).
2. Gently remove used gasket material from the body and cover, being careful not to damage the gasket sealing faces.
3. Carefully fit a new gasket (item 2) into the existing body (See Fig. 16).
4. **Refit the cover assembly to the body**, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
5. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).

Bolt size	Socket size	Tightening torque
M12 x 40	19 mm A/F	$63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$)

6. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

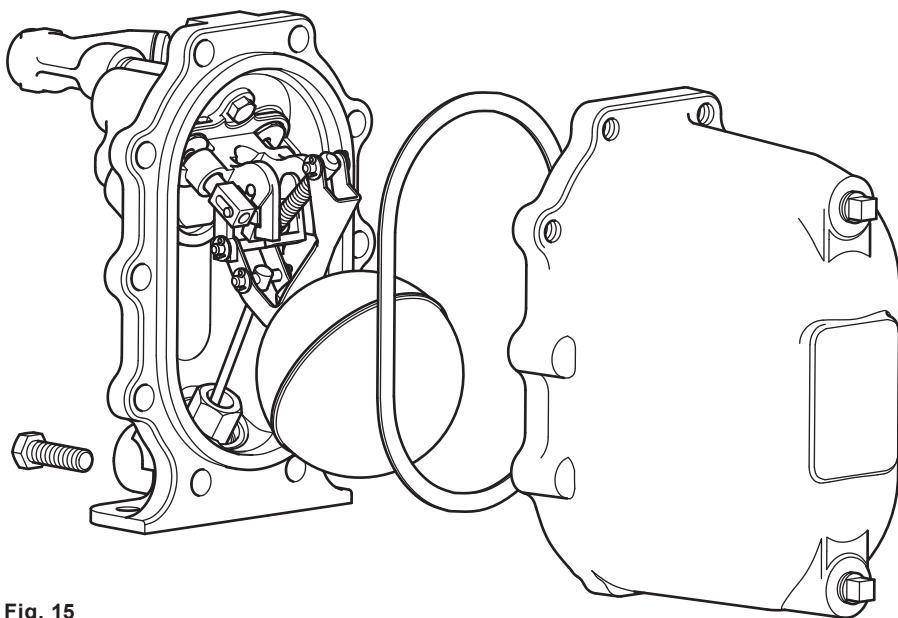


Fig. 15

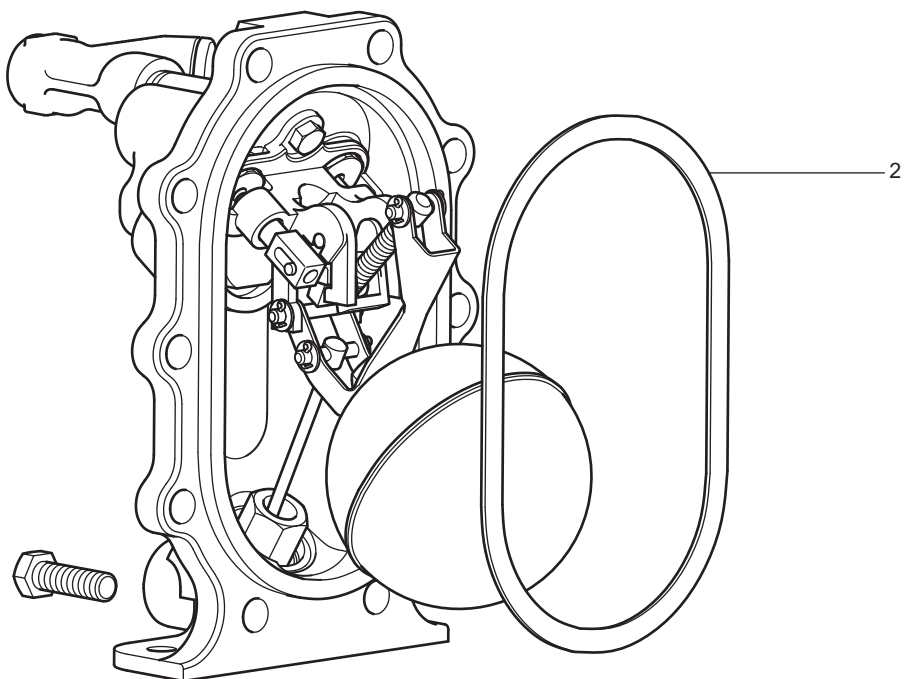


Fig. 16

7.2 Replacement of inlet swing check valve

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, 13 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the inlet swing check valve

1. Remove cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Carefully remove the circlip from the end of the steam inlet valve (item 17).
4. Remove the three M8 bolts that secure the pump mechanism bracket using the 13 mm A/F socket.
5. Lift away the pump bracket assembly (See Fig. 17). This will allow access to the inlet swing check valve (item 12).

Note: Do not allow the spring in the pump mechanism to bend back on itself as this may damage the coils and shorten the life of the spring.

6. The swing check valve flap can now easily be withdrawn.
7. Fit a new flap, ensuring the face of the check valve flap and seat are clean and free from damage.
8. **Reassembly is the opposite to removal.**
9. Tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft).
10. It is important to ensure a new circlip is refitted to the steam inlet valve.
11. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
12. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).
13. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

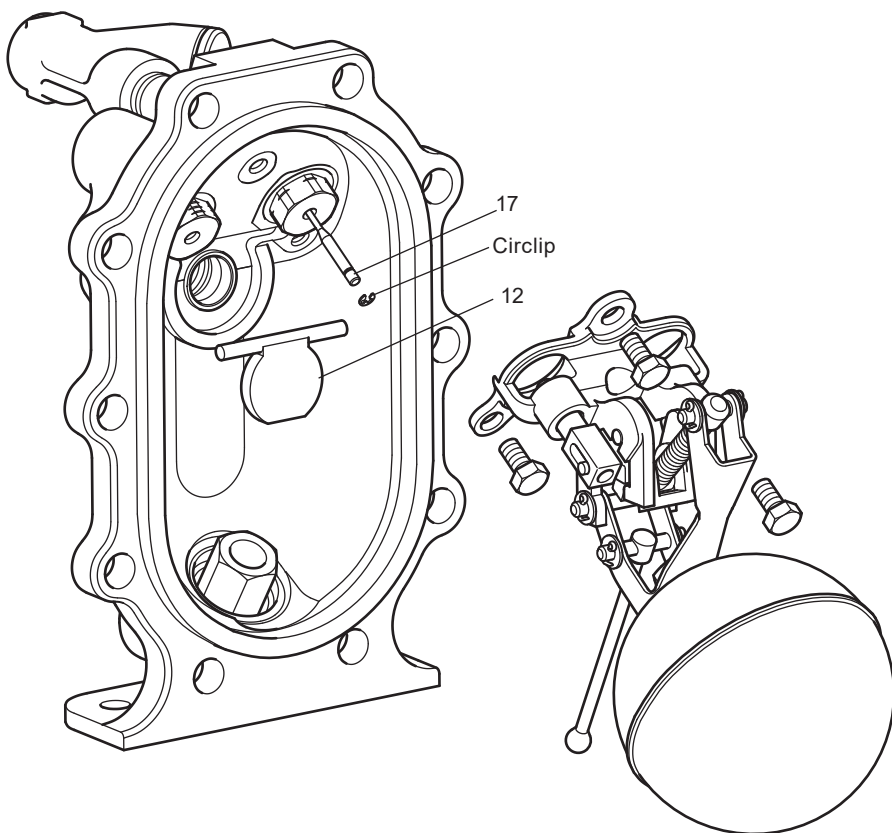


Fig. 17

7.3 Replacement of spring and actuator arm

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the spring and actuator arm

1. Remove cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Ensure the float is at the bottom of its travel.
4. Remove the split pin and washer, from the spring retaining shaft (Y). (See Fig. 18).
5. Remove the shaft and allow the spring assembly to drop free.
6. Draw the actuator arm downwards within its slots until it comes free. It may be necessary to slide the exhaust valve (item 18) backwards against its internal spring to free it from the pump bracket guide (item 13).
7. Gently remove the exhaust valve from the spigot of the actuator arm (item 24, shown in Fig. 18) being careful not to damage or lose the small exhaust valve compression spring.
8. The spring assembly and actuator arm can both be replaced.
9. **Fitting the new spring assembly and actuator arm is the opposite to removal.**

Remember to compress the small spring within the exhaust valve (item 18) before refitting to the tanged spigot of the new actuator arm.

10. Ensure the actuator is correctly aligned and located within the slots of the pump bracket (item 13).
11. Once this is correctly located, ensure the exhaust valve can slide easily within its guides.
12. Always use new split pins and washers when refitting the spring retaining shaft (Y).
13. With the mechanism fully assembled, reposition the cover assembly with the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
14. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).
15. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

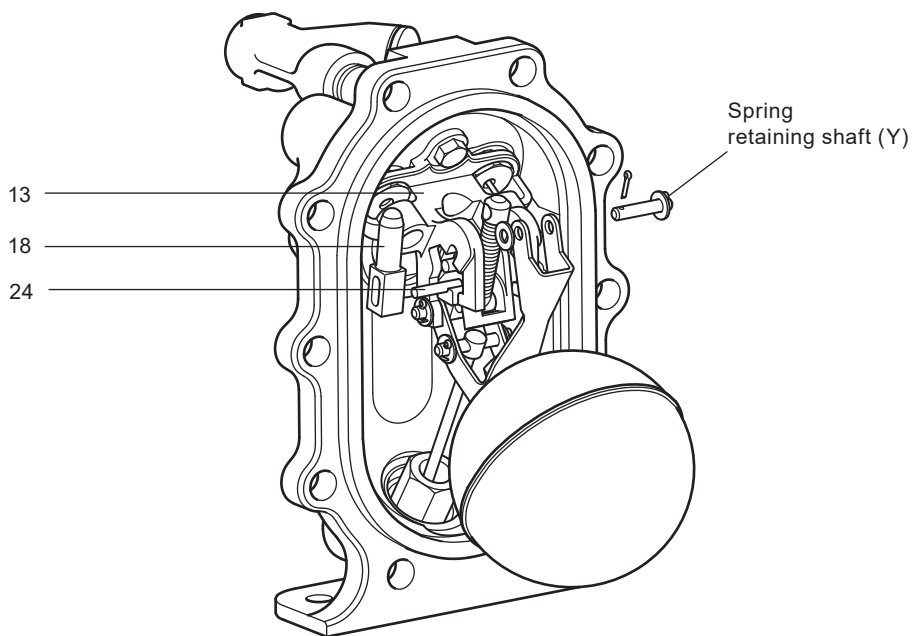


Fig. 18

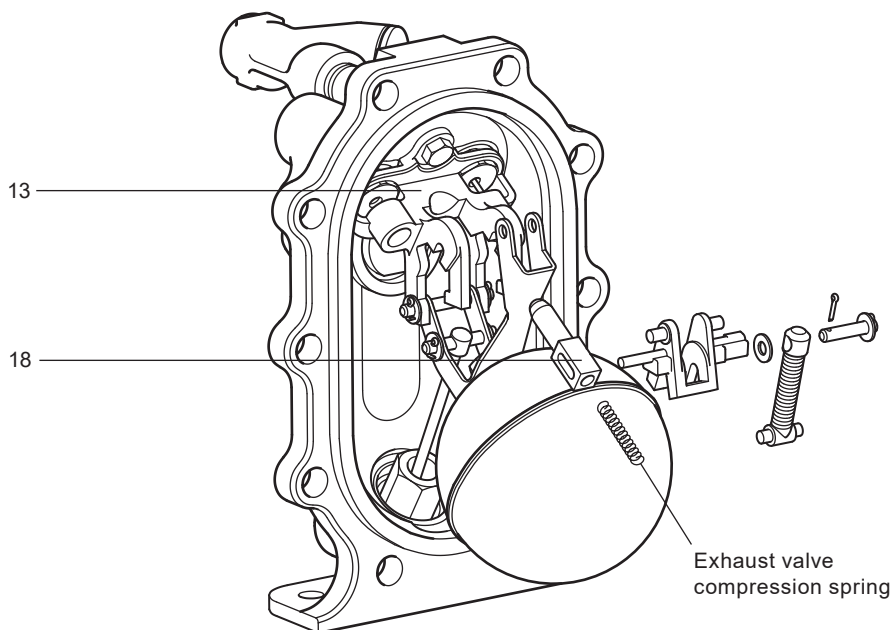


Fig. 19

7.4 Replacement of float

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, 13 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the float and lever

1. Remove cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Remove the split pin and washer from one side of the spring retaining shaft (Y) and carefully remove. (See Fig. 20).
Note: It is extremely important this is done first to prevent over stressing the spring during Step 4.
4. Remove the split pin and washer from one side of trap pivot retaining shaft (Z) and carefully remove.
5. Carefully slide the shafts out from their respective positions observing the orientation of the spring and actuator arm (item 14, 24) within the pump bracket (item 13) as these will need to be refitted later.
6. Remove the split pin and washer from one side of pump pivot retaining shaft (X).
7. To remove shaft (X), the whole pump bracket (13) will need to be separated from the cover. This can be done by unscrewing the three M8 retaining bolts, and **removing the circlip from the steam inlet valve (17)**. Remove the pump pivot retaining shaft (X).
8. The float and lever assembly can now be removed and discarded as the replacement float and lever is supplied fully assembled in the spares kit.
9. **Assembly is the opposite to removal.** Always fit new split pins and washers.
10. It is easier to fit the replacement shafts in the following sequence:- (See Fig. 21).

X. Pump pivot (shaft length 52 mm)

Refit pump bracket (13) to cover and tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft). Refit the new circlip to the steam inlet valve.

Z. Trap pivot (shaft length 40 mm)

Y. Spring retainer (shaft length 30 mm)

leaving the spring retaining shaft until after the spring and actuator arm have been correctly aligned and located within the slot of the pump bracket (item 13).

Ensure the spigot of the actuator arm is correctly engaged with the exhaust valve.

Remember to compress the small spring within the exhaust valve (item 18) before refitting to the spigot of the new actuator arm.

11. When all the shafts have been secured using new split pins and washers, move the float to its upper and lower limit to ensure the mechanism operates smoothly and the spring and actuator arm snaps over to operate the motive steam inlet and exhaust valves (items 17, 18). **Note:** The mechanism has been designed to be adjustment-free, simplifying the fitting of new parts. If after assembly the mechanism does not operate correctly, check all the parts are assembled and aligned as per the diagram.

12. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
13. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).
14. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

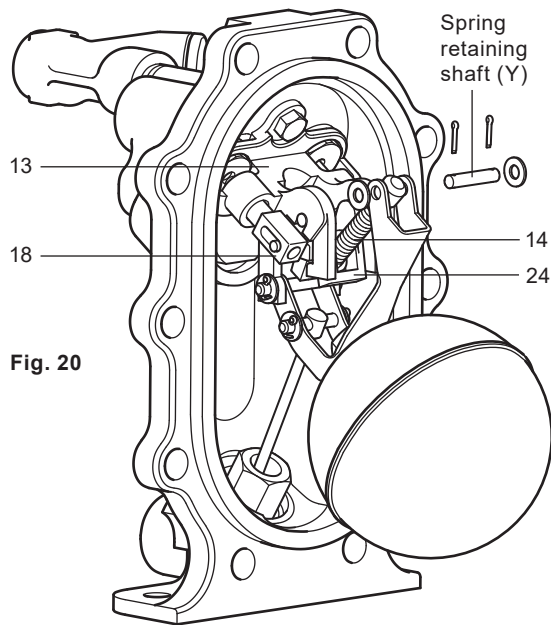


Fig. 20

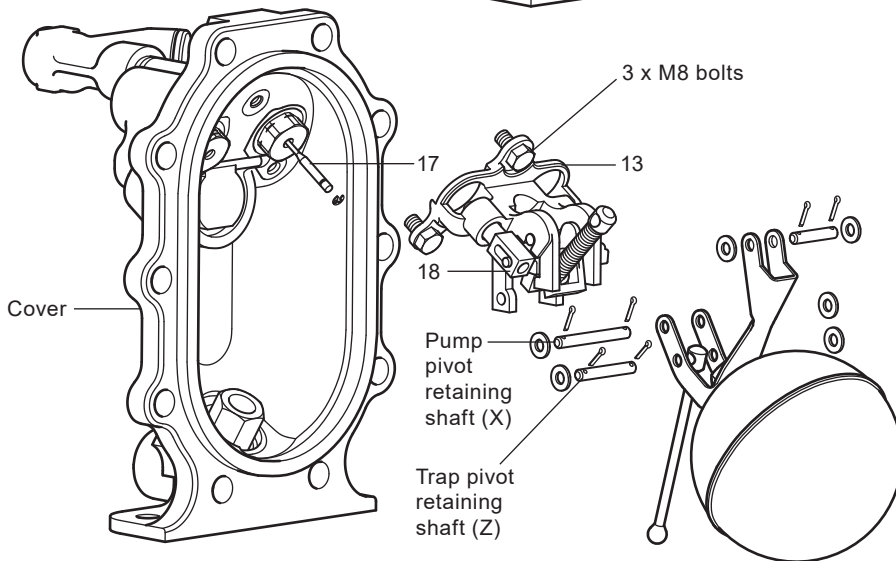


Fig. 21

8. Replacement of spares (2)

Section 8. covers the replacement of the following spares:- trap and outlet check valve mechanism and steam inlet /exhaust valves and seats.

Important - safety note

Before any installation or maintenance procedure, ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism.

Always handle with care.

8.1 Replacement of trap and outlet check valve mechanism

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 19 mm A/F socket, 24 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers.

To fit the new trap and outlet check valve mechanism

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the cover assembly away from the body (135 mm [5½"] minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
2. Gently remove used gasket material from the body and cover being careful not to damage the gasket sealing faces.
3. Carefully fit a new gasket (item 2) into the existing body.
4. Remove split pin, washer and shaft from the trap pivot (Z) (See Fig. 22).
5. Remove trap valve stem (item 22) from the mechanism.
6. The float and lever (items 5, 6) can now be swung up out of the way leaving access to the trap and check valve assembly.
7. Using the 24 mm A/F socket unscrew the trap and check valve housing (item 9).
8. The whole trap and check valve assembly can now be carefully withdrawn from the cover.
9. There are no serviceable parts within this assembly; the replacement spares kit contains all new parts.
10. Before fitting a new mechanism, clean the trap housing bore within the cover ensuring any sludge or scale is carefully removed. Remember to fit a new gasket (item 23).
11. **Assembly is the opposite to removal.**

12. Tighten the 24 mm A/F trap housing to 125 ± 7 N m (92 ± 5 lbf ft).
13. Refit the trap valve stem and trap pivot shaft (Z) (length 40 mm) remembering to use new split pins and washers - to the trap lever (item 5).
14. Move the float to its upper and lower limits to ensure the trap mechanism operates smoothly and the valve stem (item 22) slides smoothly within its guide.
15. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
16. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).

Bolt size	Socket size	Tightening torque
M12 x 45	19 mm A/F	63 ± 5 N m (46.5 ± 4 lbf ft).

17. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready for recommission.

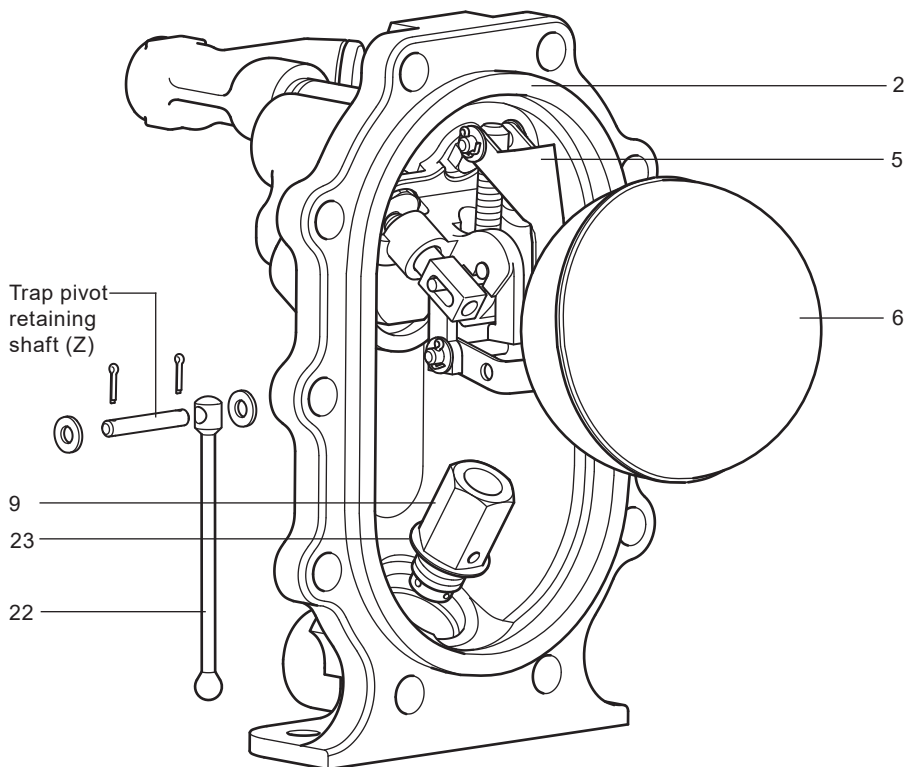


Fig. 22

8.2 Replacement of steam inlet/exhaust valves and seats

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required : 13 mm, 19 mm A/F sockets, 24 mm Deep series A/F socket , Flat blade screw driver, Torque wrench, Long nose pliers

To replace the steam inlet and exhaust valve and seats

1. Remove cover and old gasket (see cover gasket replacement procedure Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Carefully remove the circlip from the end of the steam inlet valve (item 17).
4. Remove the three M8 bolts (items 20) using the 13 mm A/F socket.
5. Lift away the whole pump bracket assembly as this will allow access to the valve seats.
Note: Do not allow the spring in the pump mechanism to bend back on itself as this may damage the coils and shorten the life of the spring.
6. Using the 24 mm socket unscrew both the steam inlet and exhaust seats.
7. The seats, metal gaskets and steam inlet valve can now be removed.
8. Carefully clean the threads and gasket faces within the cover assembly ensuring all residues are removed.
9. Insert the replacement steam valve assembly (item 17) and exhaust valve (item 16) according to Fig. 23.
10. Place a new metal gasket (item 19) onto the threads of the seat before tightening into the cover.
11. Tighten the seat using the 24 mm socket to 125 ± 7 N m (92 ± 5 lbf ft).
12. The exhaust seat can be replaced in a similar way.
13. Refit the whole pump bracket to the cover and tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft).
14. It is important to ensure a new circlip is fitted to the steam inlet valve after the bracket has been bolted in place.
15. To remove the exhaust valve (item 18), remove split pins, washers, and shaft (Y) from the top spring pivot point. (See Fig. 24).
16. Remove the shaft and allow the spring assembly to drop free.
17. Draw the actuator arm downwards within its slots until it comes free. It may be necessary to slide the exhaust valve backwards against its internal spring to free it from the pump bracket guide (item 13).
18. Gently remove the exhaust valve away from the tanged spigot of the actuator arm.
19. **Fitting the replacement exhaust valve is the opposite to removal**, remembering to compress the small spring within the new valve before refitting to the spigot of the actuator arm.

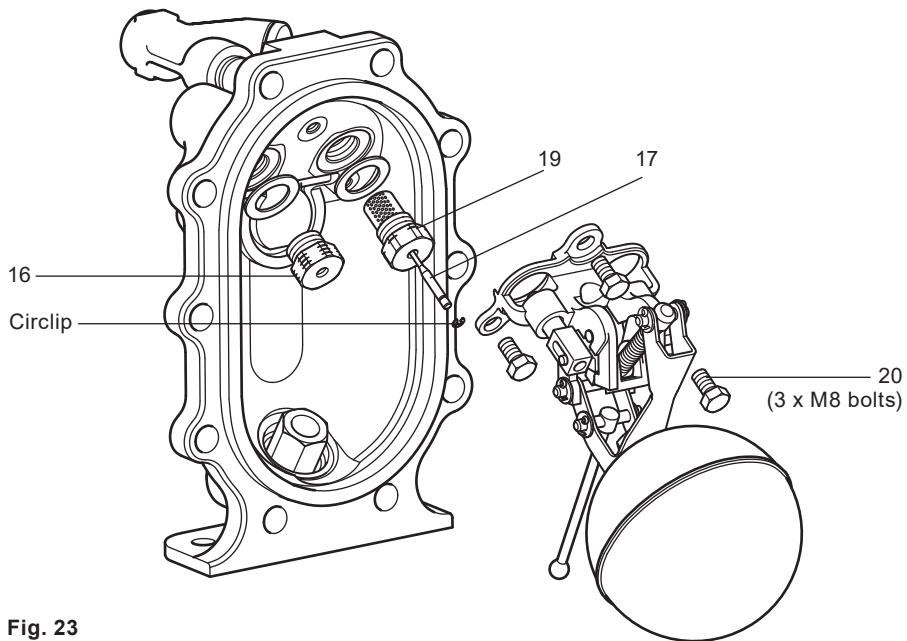


Fig. 23

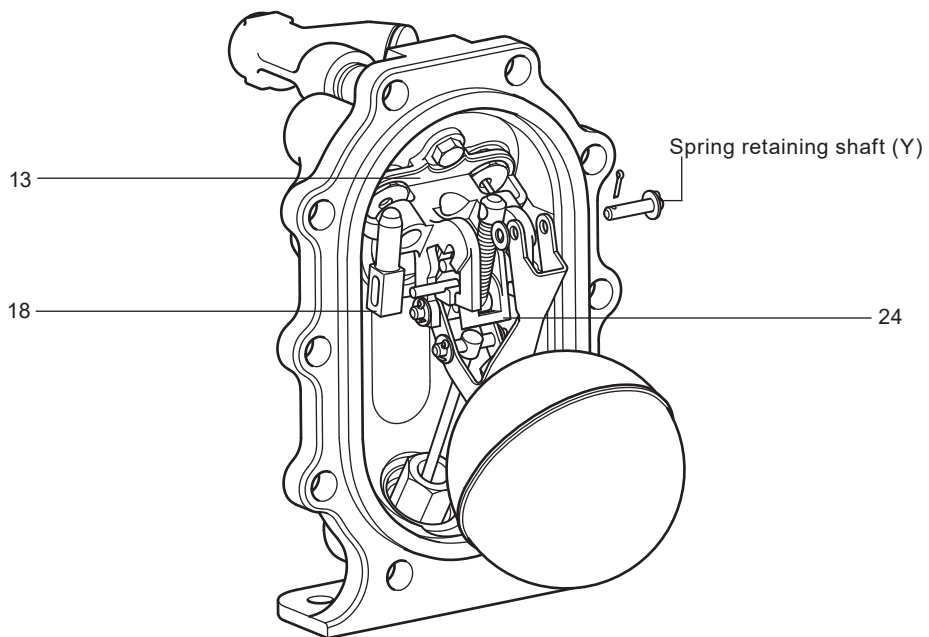


Fig. 24

19. Ensure the actuator is correctly aligned and located within the slots of the pump bracket (item 13).
20. Once this is correctly located, ensure the exhaust valve can slide easily within its guides.
21. Always use new split pins and washers when refitting the spring retaining shaft (Y) (30 mm long).
22. Check that the mechanism snaps over and opens and closes the valves by moving the float to its upper and lower limit of travel.

Note: The valve gear has been designed to be adjustment-free, simplifying the fitting of new parts. If after assembly the mechanism does not operate correctly, check all the parts are assembled and aligned as per Fig. 25.
23. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
24. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).
25. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

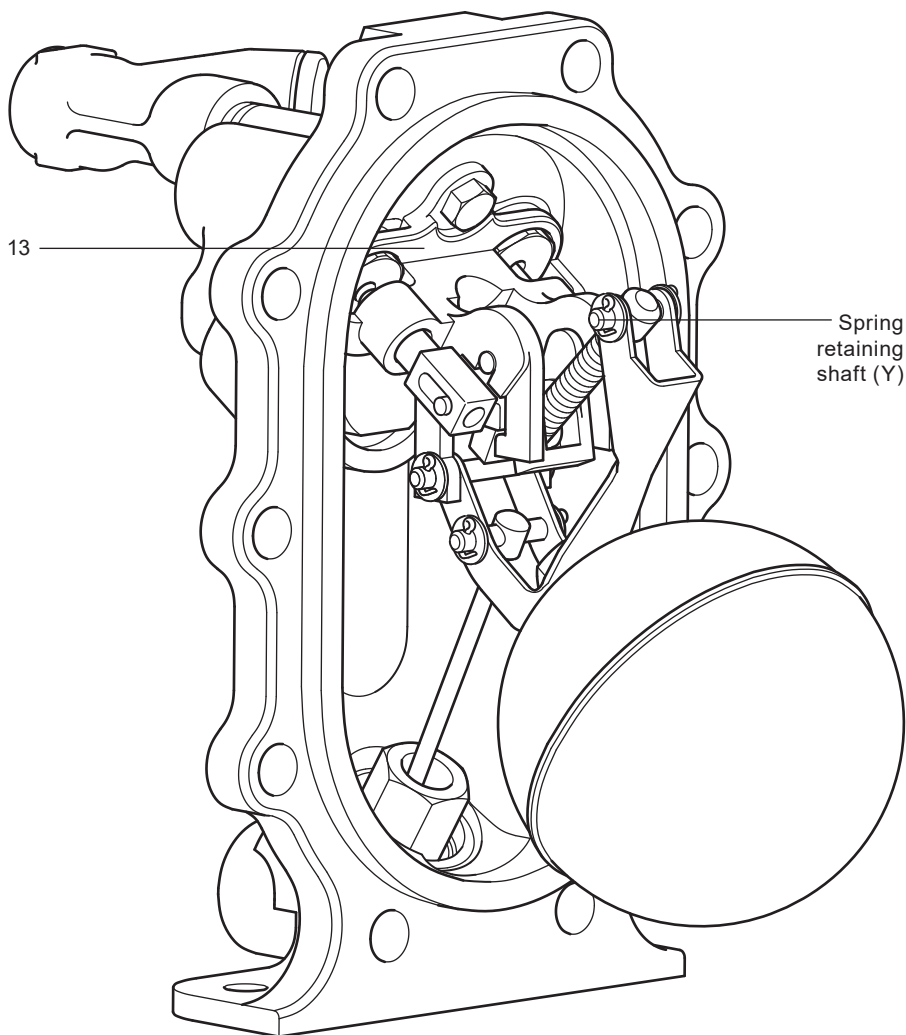


Fig. 25

9. Fault finding guide

Caution

Installation and trouble shooting should only be performed by qualified personnel. Before any maintenance is attempted, ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled

to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured. When dismantling this product, care should be taken to prevent injury from the snap action mechanism. Always handle with care.

The APT10-4.5 has been thoroughly tested before it leaves the factory. This includes a comprehensive functional test. If the unit has failed to operate it is likely that an installation problem could exist. Please check the following before commencing with the trouble-shooting chart.

9.1 Trouble areas to check first:-

- Are all isolating valves open?
- Is the condensate inlet strainer (as recommended in Fig. 5 page 11) clean and free from debris?
- Does the installation head available exceed 0.2 m (8") from the base of the pump?
- Is the available motive pressure higher than the total backpressure (not exceeding 4.5 bar g (65 psi g))?
- Is the exhaust balance line (E) connected to the outlet of the equipment being drained and is it free from obstruction (refer to the installation diagram Fig. 5, page 11)?
- Is the direction of flow through the unit correct, indicated by the flow arrow?

9.2 Quick reference trouble-shooting guide

SYMPTOM	APT10-4.5 fails to operate on start-up
CAUSE 1	No motive pressure.
CHECK and CURE	Motive supply pressure exceeds total backpressure.
CAUSE 2	Inlet isolation valve maybe closed.
CHECK and CURE	Inlet pipe is free from obstructions and the isolation valve is open.
CAUSE 3	Motive inlet and exhaust lines incorrectly connected.
CHECK and CURE	Motive = S, Exhaust = E.
CAUSE 4	The rate of condensate produced by the process maybe very low, causing the APT to cycle slowly.
CHECK and CURE	The process being drained is operating correctly.
SYMPTOM	Equipment flooded - but APT10-4.5 appears to cycle normally
CAUSE 1	The APT10-4.5 is undersized for the application.
CHECK and CURE	Check system parameters agree with the custom sizing sheet / graph.

SYMPTOM	Equipment flooded and APT10-4.5 has stopped cycling
CAUSE 1	Blocked exhaust line.
CHECK and CURE	Balance line is free from obstruction and is not waterlogged. Refer to installation diagram Fig. 5 page 11.
CAUSE 2	Blocked condensate inlet line.
CHECK and CURE	Inspect and clean the strainer mesh, check for blockages.
CAUSE 3	Blocked condensate outlet line.
CHECK and CURE	Inspect line for blockages.
CAUSE 4	Damaged mechanism.
CHECK and CURE	Mechanism operates as per Section 6. Replace malfunctioning part.
CAUSE 5	No motive steam available.
CHECK and CURE	Steam supply to APT10-4.5 is available and at the correct pressure.
CAUSE 6	Leaking motive inlet valve.
CHECK and CURE	If APT10-4.5 body is hot (observe safety note), this indicates the APT10's part as per Section 8.
CAUSE 7	Broken spring.
CHECK and CURE	If APT10-4.5 body is cold, this indicates the APT10's mechanism is stuck on the filling cycle. Check pump mechanism spring - replace malfunctioning part as per Section 7.
CAUSE 8	Blocked condensate inlet line.
CHECK and CURE	Inspect and clean the filter, check for blockages.

SYMPTOM	Chattering or banging of the APT10-4.5 during cold start-up
CAUSE 1	Hydraulic pulsing of the inlet check valve.
CHECK and CURE	Reduce installation head to APT - install throttling valve on APT10-4.5 condensate inlet.
SYMPTOM	Chattering or banging in the return line after APT10-4.5 discharges
CAUSE 1	Live steam entering discharge line.
CHECK and CURE	Ensure steam traps draining the motive supply line are discharging to a non-flooded condensate return.

