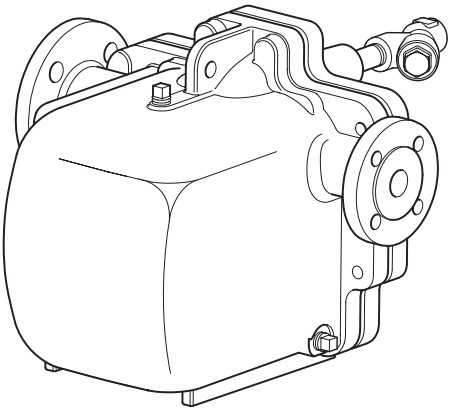
APT14, APT14HC and APT14SHC Automatic Pump Traps

Installation and Maintenance Instructions



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

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1. Safety information

Safe operation of these products can only be guaranteed if they are 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.

The products listed below fully comply with the requirements of the European Pressure Equipment Directive 2014/68/EU, ATEX Directive 94/9/EC and carry the CE and Ex marks when so required.

The products fall within the following Pressure Equipment Directive categories:

Product		Group 2 Gases	Group 2 Liquids
APT14		1	SEP
APT14HC		2	SEP
APT14SHC		2	SEP
DCV10	DN40 PN25 rated	SEP	SEP
	DN50 Class 300 rated	1	SEP
Motive strainer	DN15	SEP	SEP

Product marking per ATEX Directive 94/9/EC Ex II 2G CT3.

i) **The products have been designed for use on steam, air and water/condensate which are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other fluids may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.**

ii) **Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of 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.**

iii) **Determine the correct installation situation and direction of fluid flow.**

iv) **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.**

v) **Remove protection covers including cardboard support flanges 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.

Please note

For specific details relating to the weight and internal mechanism of these products, see Section 2.

Product specific - safe lifting information

Please note that the Spirax Sarco APT14 automatic pump trap units come complete with holes which may be tapped or untapped. These holes may be used for lifting purposes at the sole risk and responsibilty of the purchaser.

The purchaser is responsible for the selection and use of the correct eye-bolt or shackle combination and is, in whole, responsible for all lifting operations and operator competency at their location. Spirax Sarco will ensure that any tapped hole will have a spot face larger than the shoulder of a standard eye-bolt to allow seating down to the shoulder. However, it should not be assumed that an eye-bolt is suitable for lifting the product simply on the basis of shoulder size.

Spirax Sarco will accept no responsibility for loss or damage real or imagined, caused by incorrect or inappropriate lifting of our products.

Spirax Sarco will ensure that the tapped holes provided are clearly marked with the exact size and thread form. We will also carry out in conjunction with a third party, a test on a sample of each product so provided and make available a copy of the test procedure and test certificate on request.

Furthermore and without obligation Spirax Sarco will attach to each product provided with such holes, threaded or otherwise, a disclaimer affixed to the product explaining the purchaser's duty under the LOLER regulations for safe off-loading and lifting of the product at their premises.

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 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.

Please visit the Spirax Sarco product compliance web pages
https://www.spiraxsarco.com/product-compliance
for up to date information on any substances of concern that may be contained within this product. Where no additional information is provided on the Spirax Sarco product compliance web page, this product may be safely recycled and/or disposed providing due care is taken. Always check your local recycling and disposal regulations.

1.16 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. General product information

2.1 General description

The Spirax Sarco automatic pump trap is a flanged or screwed displacement receiver pressure rated to PN16. The unit is capable of automatically trapping or pumping, depending on pipeline conditions. The unit is operated by steam (saturated or superheated) and is used to remove condensate from process plant under all operating conditions including vacuum.

Definition of motive steam

For clarity throughout this document, it is important to note that the term 'motive steam' is used to describe both saturated steam and superheated steam.

Design compliance

The shell of the product has been designed in accordance with A.D. Merkblatter/ASME VIII.

Optional extra

Both the APT14 and APT14HC are available with the **body and cover coated with electroless nickel plate (ENP)**. This option, when required, will be denoted as **APT14 ENP** and **APT14HC ENP** respectively and must be stated at the time of order placement.

The APT14, APT14HC and APT14SHC are available with the body drilled, tapped and plugged to accept sight level gauges. **Note:** Sight level gauges can not be fitted retrospectively to the standard APT14, APT14HC or APT14SHC.

Sight level gauges, supplied separately, are available for the APT14, APT14HC or APT14SHC. For further details contact Spirax Sarco.

Standards

These products fully comply with the requirements of the European Pressure Equipment Directive 2014/68/EU, ATEX Directive 94/9/EC and carry the CE and Ex marks when so required.

Certification

These products are available with certification to EN 10204 3.1.
Note: All certification / inspection requirements must be stated at the time of order placement.

2.2 Sizes and pipe connections

Model and body material	Inlet and outlet sizes and pipe connections	Motive/exhaust		
APT14 SG iron	Flanged DN40 inlet x DN25 outlet	EN 1092 PN16	BSP T Rp (ISO 7-1) or NPT	DN15 (½")
		ASME B 16.5 (ANSI) 150	NPT	
		JIS 10 (JIS B 2210)	BSP T Rp (ISO 7-1)	
		KS 10 (KS B 1511)	BSP T Rp (ISO 7-1)	
	Screwed 1½" inlet x 1" outlet	BSP T Rp (ISO 7-1)	BSP T Rp (ISO 7-1)	
		NPT	NPT	
APT14HC SG iron	Flanged DN50 inlet x DN40 outlet	EN 1092 PN16	BSP T Rp (ISO 7-1)	
		ASME B 16.5 (ANSI) 150	NPT	
APT14SHC Carbon steel		JIS 10 (JIS B 2210)	BSP T Rp (ISO 7-1)	
		KS 10 (KS B 1511)	BSP T Rp (ISO 7-1)	

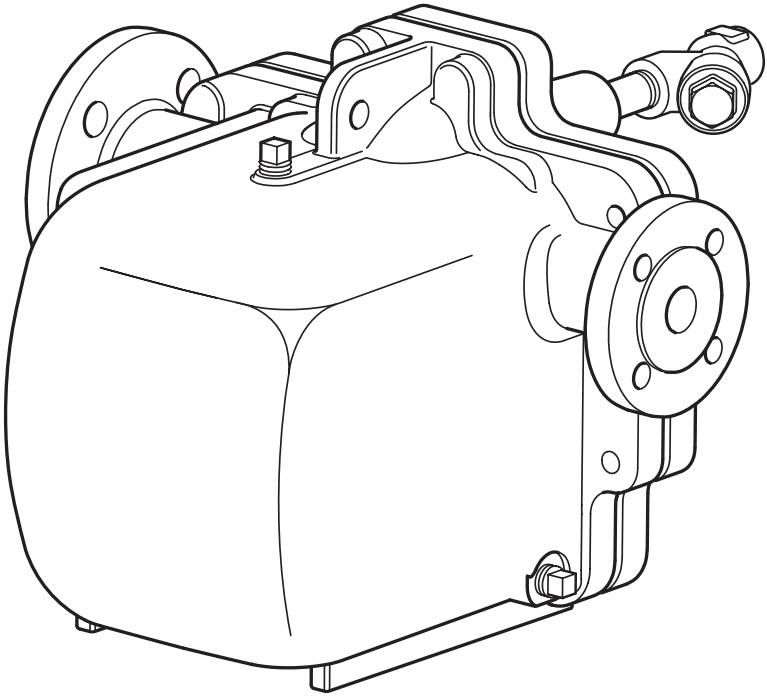
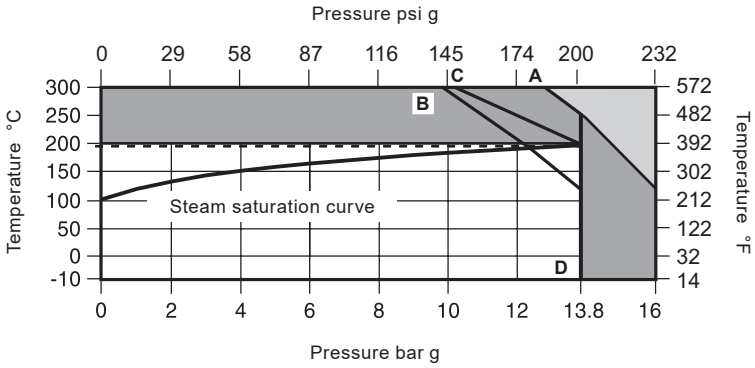


Fig. 1 APT14 shown

2.3 Pressure/temperature limits - APT14 and APT14HC (SG iron) - see Section 2.4 for the APT14SHC



The product **must not** be used in this region.

The product should not be used in this region or beyond its operating range as damage to the internals may occur.

A - D Flanged PN16.

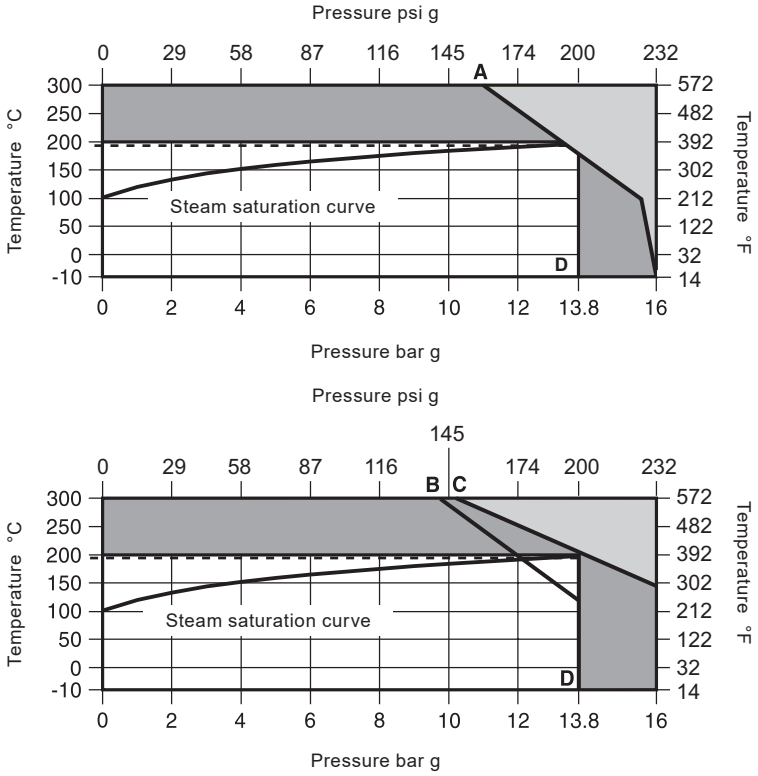
B - D Flanged JIS/KS 10.

C - D Flanged ANSI 150.

Superheated steam should not exceed the following parameters:
13.8 bar g @ 198 °C (200 psi g @ 388 °F)

Body design conditions			PN16
Maximum motive inlet pressure		13.8 bar g	(200 psi g)
PMA	Maximum allowable pressure	16 bar g @ 120 °C	(232 psi g @ 248 °F)
TMA	Maximum allowable temperature	300 °C @ 12.8 bar g	(572 °F @ 186 psi g)
Minimum allowable temperature **Note:** For lower temperatures consult Spirax Sarco.		-10 °C	(14 °F)
PMO	Maximum operating pressure for saturated and superheated steam service	13.8 bar g @ 198 °C	(200 psi g @ 388 °F)
Maximum backpressure - for standard pumps **Note:** For higher backpressures contact Spirax Sarco		5 bar g	(72.5 psi g)
TMO	Maximum operating temperature for saturated and superheated steam service	198 °C @ 13.8 bar g	(388 °F @ 200 psi g)
Product is safe for use under full vacuum conditions			
Temperature limits (Ambient ⟨Ex⟩)		-10 °C to 200 °C	(14 °F to 392 °F)
Designed for a maximum cold hydraulic test pressure of:		24 bar g	(348 psi g)
Filling/ Installation head	Recommended filling head above the pump (from the base of the receiver/process)	0.3 m	(12")
	Maximum recommended installation head (from the base of the pump) for higher installation heads refer to Spirax Sarco	1 m	(39")
	Minimum installation head required (from the base of the pump)	0.2 m	(8")

2.4 Pressure/temperature limits - APT14SHC (Carbon steel) - see Section 2.3 for the APT14 and APT14HC



The product **must not** be used in this region.

The product should not be used in this region or beyond its operating range as damage to the internals may occur.

A - D Flanged PN16.

B - D Flanged JIS/KS 10.

C - D Flanged ANSI 150.

- - - - - Superheated steam should not exceed the following parameters: 13.8 bar g @ 198 °C (200 psi g @ 388 °F)

Body design conditions			PN16
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TMA	Maximum allowable temperature	300 °C @ 12.8 bar g	(572 °F @ 186 psi g)
Minimum allowable temperature **Note:** For lower temperatures consult Spirax Sarco.		-10 °C	(14 °F)
PMO	Maximum operating pressure for saturated and superheated steam service	13.8 bar g @ 198 °C	(200 psi g @ 388 °F)
Maximum backpressure - for standard pumps **Note:** For higher backpressures contact Spirax Sarco		5 bar g	(72.5 psi g)
TMO	Maximum operating temperature for saturated and superheated steam service	198 °C @ 13.8 bar g	(388 °F @ 200 psi g)
Product is safe for use under full vacuum conditions			
Temperature limits (Ambient ⟨Ex⟩)		-10 °C to 200 °C	(14 °F to 392 °F)
Designed for a maximum cold hydraulic test pressure of:		24 bar g	(348 psi g)
Filling/ Installation head	Recommended filling head above the pump (from the base of the receiver/process)	0.3 m	(12")
	Maximum recommended installation head (from the base of the pump) for higher installation heads refer to Spirax Sarco	1 m	(39")
	Minimum installation head required (from the base of the pump)	0.2 m	(8")

2.5 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 (metres, feet or inches). 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 or psi g).
3. Total backpressure in the condensate return system (bar g or psi g).
4. Heat exchanger full-load operating pressure (bar g or psi g).
5. Heat exchanger maximum steam load (kg/h or lb/h).
6. Minimum temperature of secondary fluid. (°C).
7. Maximum controlled temperature of secondary fluid (°C or °F).

Model	APT14	APT14HC and APT14SHC
Pump discharge/cycle	5 litres (1.1 gallons)	8 litres (1.76 gallons)

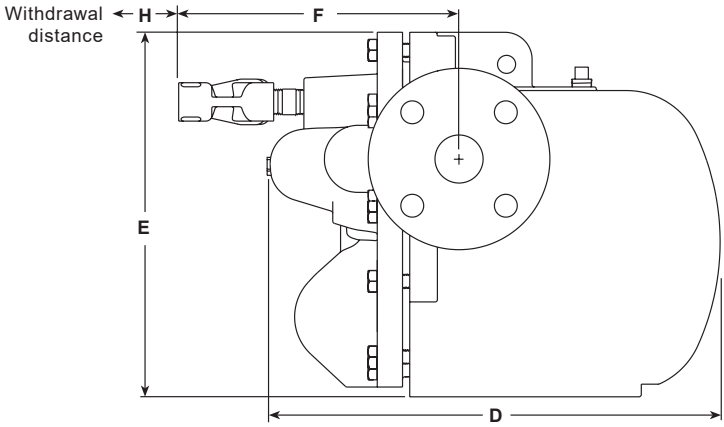
2.6 Dimensions / weights

Metric (approximate) in mm and kg

Model		A	B	C	D	E	F	G	H	I		J	Weight
										PN16	ANSI		
APT14	Screwed	350	198	246	385	304	258	57	250	-	-	198	45
	Flanged	389	198	246	385	304	258	57	250	-	-	198	45
APT14HC	Flanged	476	198	270	400	335	261	57	275	31.5	45	198	65
APT14SHC	Flanged	508	206	278	407	351	261	57	275	31.5	45	206	105

Imperial (approximate) in inches and lbs

APT14	Screwed	13.78	7.8	9.69	15.16	11.97	10.16	2.24	9.84	-	-	7.80	99.26
	Flanged	15.31	7.8	9.69	15.16	11.97	10.16	2.24	9.84	-	-	7.80	99.26
APT14HC	Flanged	18.74	7.8	10.63	15.75	13.19	10.27	2.24	10.83	1.24	1.77	7.80	143.33
APT14SHC	Flanged	99.9	8.1	10.94	16.62	13.82	10.27	2.24	10.83	1.24	1.77	8.11	231.53



Note:
Installation of a DN40 outlet check valve type DCV10 is required for the APT14HC and APT14SHC only

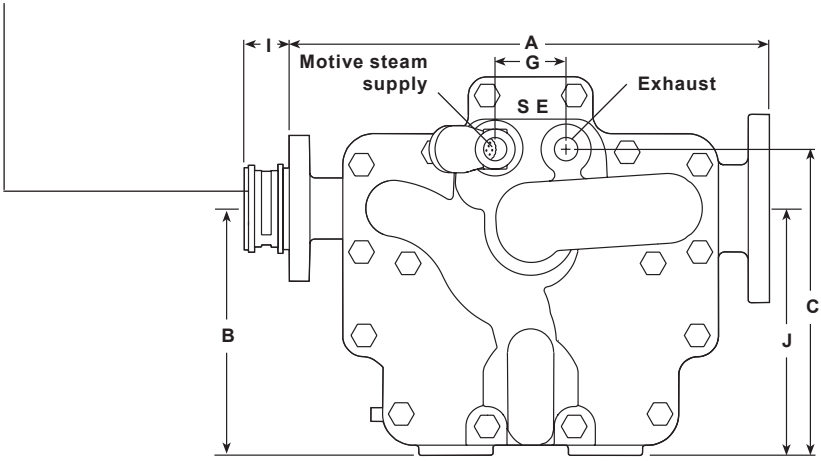


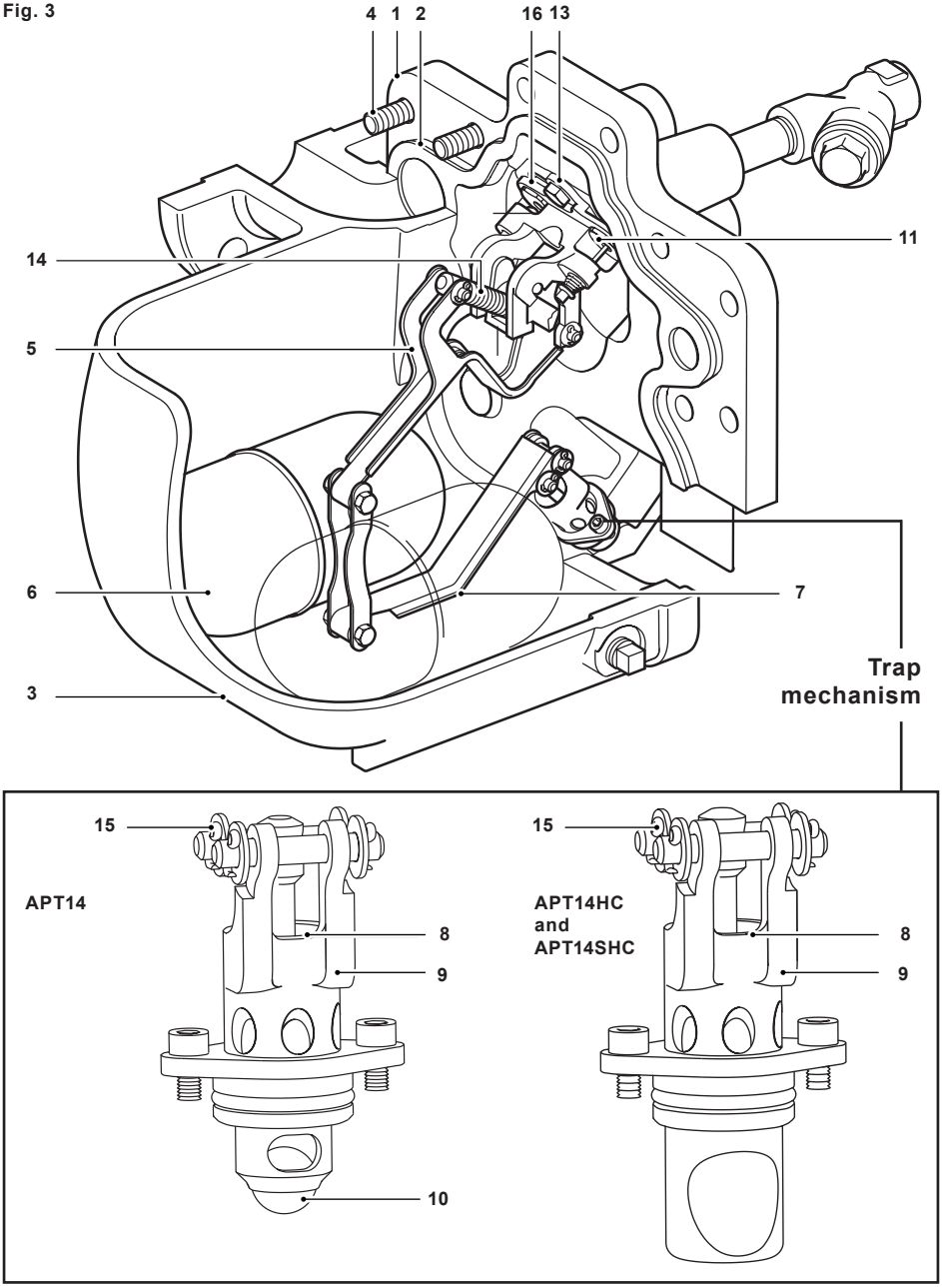
Fig. 2

2.7 Materials

No.	Part		Material	
1	Cover	APT14	SG iron	EN JS 1025 or ASTM A395
		APT14HC	SG iron	EN JS 1025 or ASTM A395
		APT14SHC	Carbon steel	EN 1.0619+N or ASTM A216 WCB
2	Cover gasket	Graphite laminated with stainless steel insert		
3	Body	APT14	SG iron	EN JS 1025 or ASTM A395
		APT14HC	SG iron	EN JS 1025 or ASTM A395
		APT14SHC	Carbon steel	EN 1.0619+N or ASTM A216 WCB
4	Cover bolts		Stainless steel	ISO 3506 Gr. A2 70
	4 x location pins (APT14SHC only)		Stainless steel	304
5	Pump lever		Stainless steel	BS 1449 304 S15
6	Float		Stainless steel	BS 1449 304 S15
7	Trap lever		Stainless steel	BS 1449 304 S15
8	Trap 2nd stage valve		Stainless steel	ASTM A276 440 B
9	Trap housing		Stainless steel	BS 3146 ANC 2
10	Ball (APT14 only)		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 or ASTM A276 431

For parts 17 to 29, go to pages 16 and 17

Fig. 3


4
1
2
16
13
14
11
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3
Trap mechanism
15
APT14
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10
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APT14HC and APT14SHC
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9

For parts 1 to 16, go to pages 14 and 15

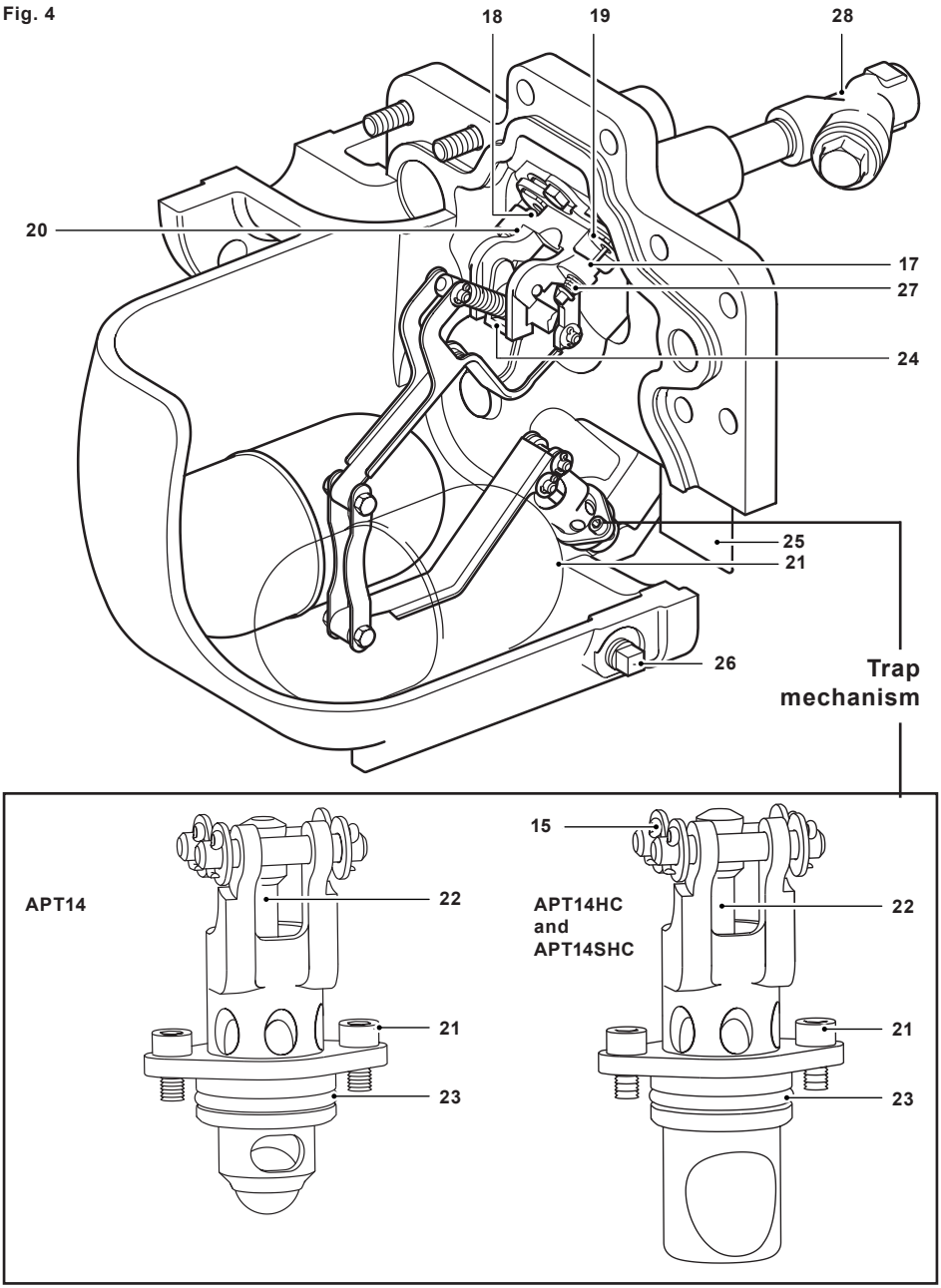
2.8 Materials

No.	Part		Material	
17	Inlet valve and seat assembly		Stainless steel	
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	ISO 3506 Gr. A2 70
21	Trap housing bolt		Stainless steel	BS 6105 A4 80
22	Trap 1**st** stage valve		Stainless steel	BS 970 431 S29 or ASTM A276 431
23	'O' ring		EPDM	
24	Actuator arm		Stainless steel	BS 3146 ANC 2
25	Name-plate		Stainless steel	BS 1449 304 S16
26	Drain plug		Steel	DIN 17440 1.4571
27	Inlet valve spring		Stainless steel	
28	Motive strainer	APT14	SG iron	
		APT14HC	SG iron	
		APT14SHC	Carbon steel	
29	DCV10 (APT14HC and APT14SHC only)		Stainless steel (not shown)	

2.9 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 as specified in Section 1, Safety information.

Fig. 4


18
19
28
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26
Trap mechanism
APT14
22
21
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15
APT14HC and APT14SHC
22
21
23

3. Operation

Step 1 (Figure 5)

The APT14, APT14HC and APT14SHC 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 multi-link pivot. If the upstream system pressure PS is sufficient to overcome the backpressure PB (Figure 4), the build up of condensate will be discharged through the opening two stage trap mechanism.
In this way, the float will automatically modulate according to the rate of condensate entering the unit, controlling the rate of opening and closure of the trap.

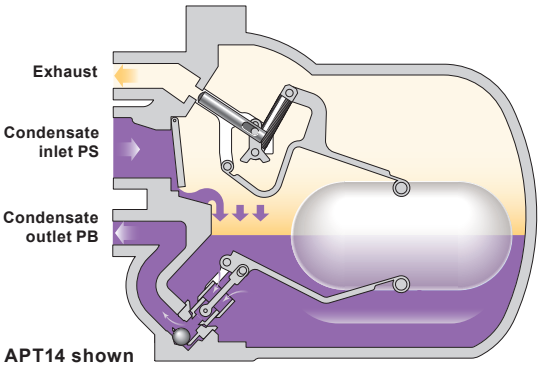


Fig. 5 APT14 shown

Step 2 (Figure 6)

With some temperature controlled equipment, it is possible for the system pressure PS to be lower than the backpressure at PB (Figure 6).
If this occurs a standard trap will stall allowing the condensate to flood the equipment being drained.

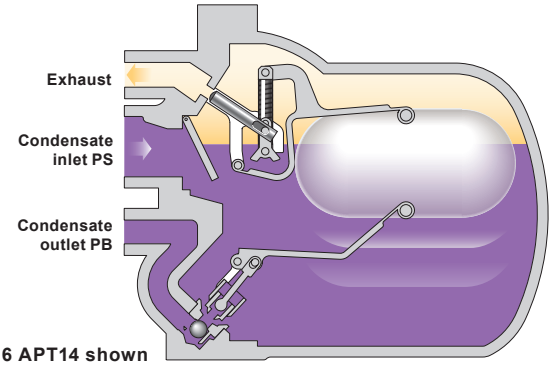


Fig. 6 APT14 shown

Step 3 (Figure 7)

However, with the APT14, APT14HC and APT14SHC, 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.

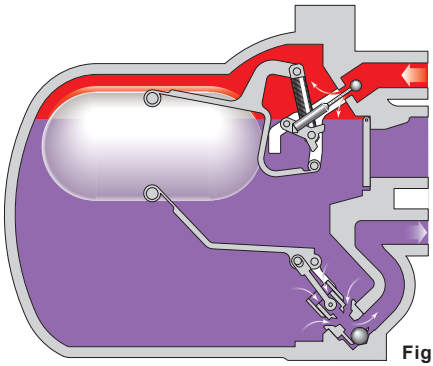


Fig. 7 APT14 shown

Step 4 (Figure 8)

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 APT14, APT14HC and APT14SHC increases above the total backpressure and the condensate is forced out through the trap seat into the plant's return system.

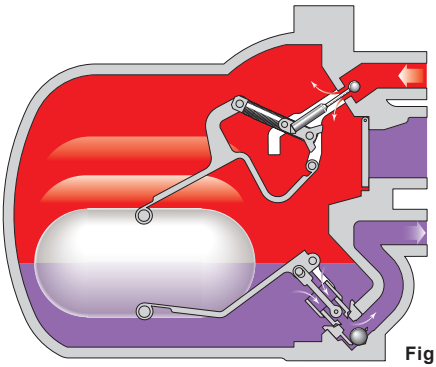


Fig. 8 APT14 shown

Steps continued on the next page

Step 5 (Figure 9)

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.

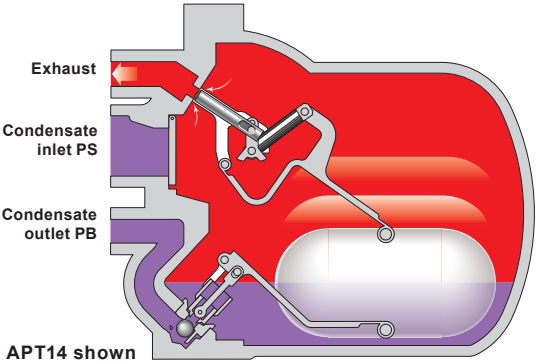


Fig. 9 APT14 shown

Step 6 (Figure 10)

As the pressure inside the APT14 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 (APT14 only) ensures no condensate can drain back into the main chamber and the trapping or pumping cycle begins again.

Note: The APT14HC and APT14SHC requires an external Spirax Sarco DN40 disc check valve to be fitted to the condensate outlet, between the flanges.

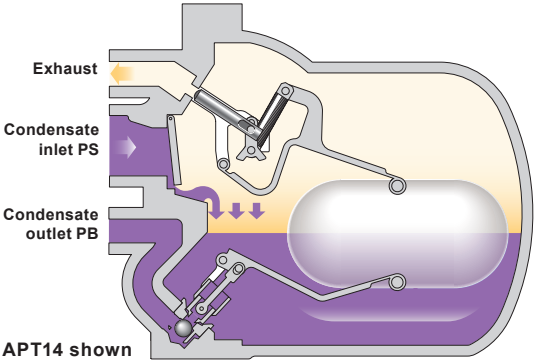


Fig. 10 APT14 shown

Return to Step 1