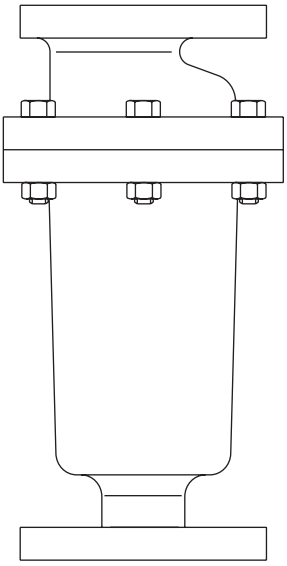
200 Series
Inverted Bucket Steam Traps
Installation and Maintenance Instructions



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 on this document) 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 comply with the requirements of the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the CE mark when so required.

The products fall within the following Pressure Equipment Directive categories:

Product		Group 2 Gases	Group 2 Liquids
211, 212, 213, 221, 222 and 223	DN15 - 25	SEP	SEP
214, 215, 216, 224, 225 and 226	DN40 - 50	1	SEP

i) **The products have been specifically designed for use on steam, air or 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 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 some products may reach temperatures in excess of 300 °C (572 °F).

Many 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 relevent Sections of the attached Installation and Maintenance Instructions for specific details relating to 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.

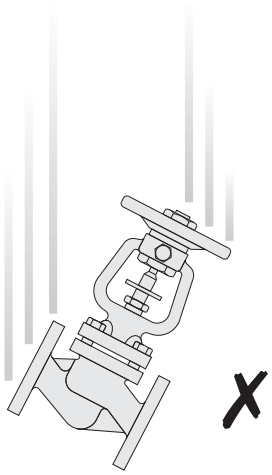
1.18 Working safely with cast iron products on steam

Cast iron products are commonly found on steam and condensate systems. If installed correctly using good steam engineering practices, it is perfectly safe.

However, because of its mechanical properties, it is less forgiving compared to other materials such as SG iron or carbon steel. The following are the good engineering practices required to prevent waterhammer and ensure safe working conditions on a steam system.

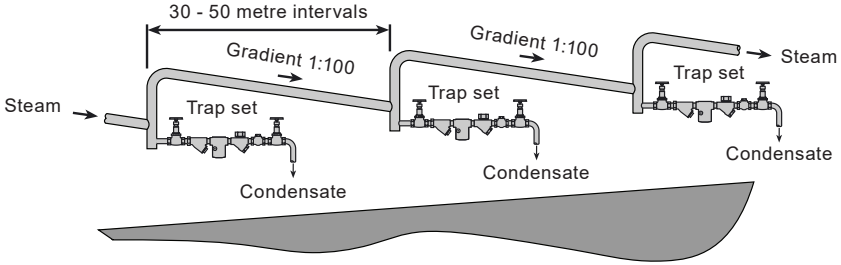
Safe Handling

Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.

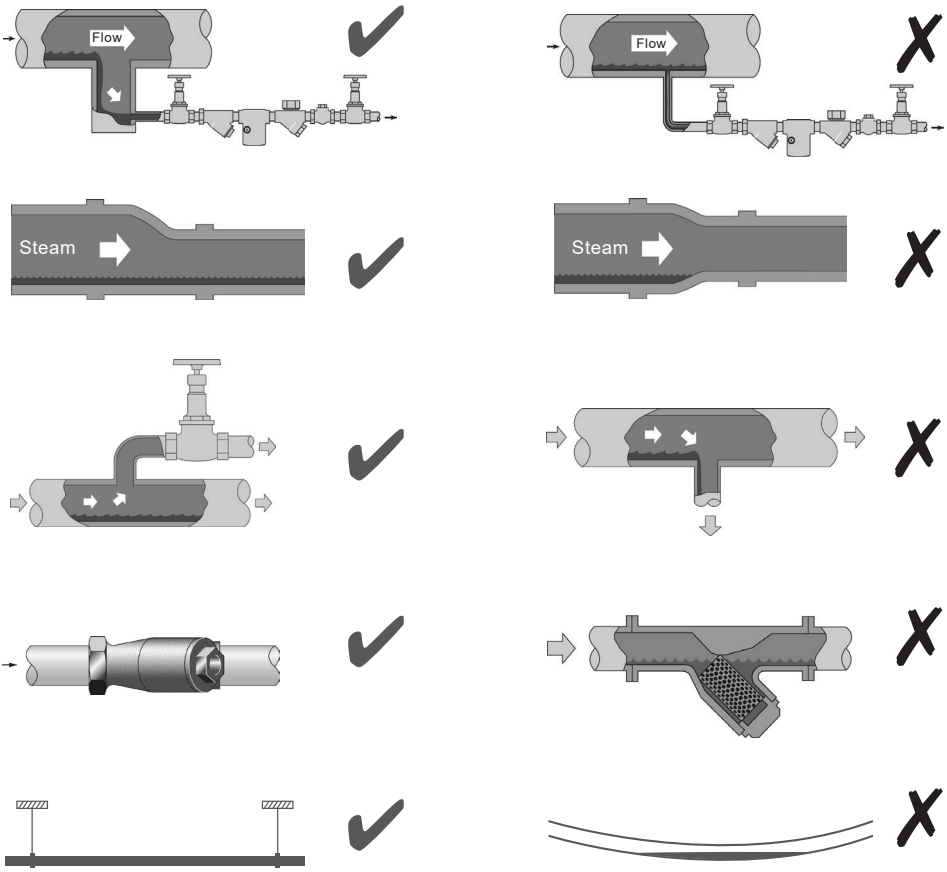


Prevention of waterhammer

Steam trapping on steam mains:



Steam Mains - Do's and Don'ts:

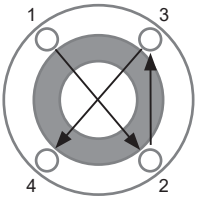


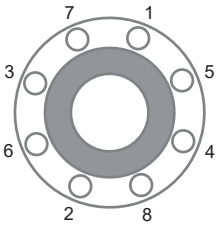
Prevention of tensile stressing

Pipe misalignment:

Installing products or re-assembling after maintenance:

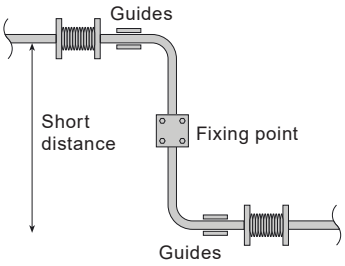
Do not over tighten.
Use correct torque figures.

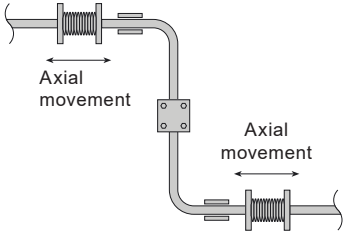


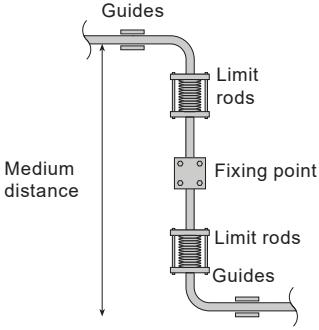


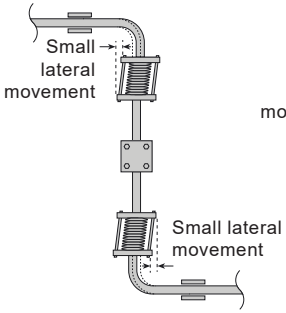
Flange bolts should be gradually tightened across diameters to ensure even load and alignment.

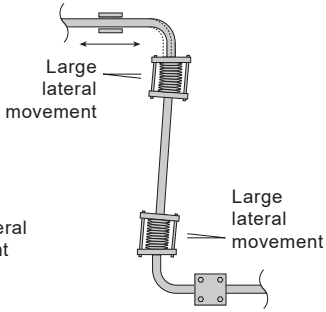
Thermal expansion:











2. General product information

2.1 General description

The Spirax Sarco 200 series of cast iron inverted bucket steam traps are designed for installation in vertical pipework with the flow vertically upwards. They are suitable for a wide range of pressures and applications up to 17 bar g (246 psi g).

Note: For additional information see the following Technical Information Sheets: TI-S03-03 and TI-S03-04.

2.2 Sizes and pipe connections

½" - 2" screwed BSP or NPT
DN15 - 50 flanged*.
*Flanges meet the requirements of BS 4504 DIN PN16, PN10, PN6 and ANSI 125.
In some sizes the inlet and outlet flanges are formed from the body casting and have tapped holes to receive studs. The stud holes are tapped UNC in ANSI flanges and metric in BS 4504 DIN flanges.

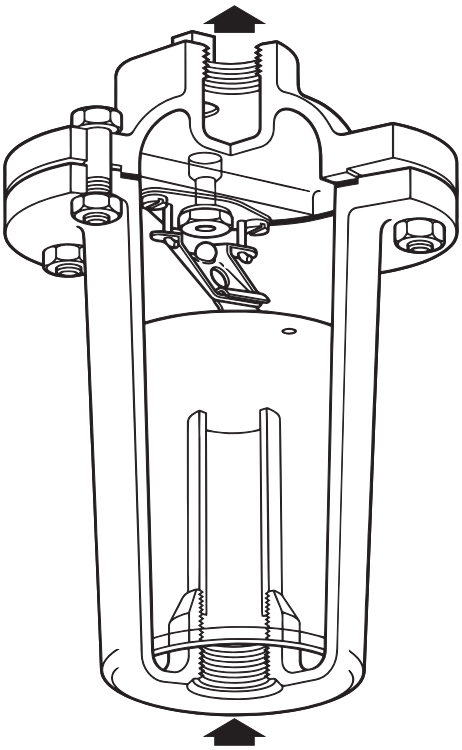


Fig. 1 200 Series screwed trap shown
Traps with flanged connections have bodies and covers which may vary from the one shown above.

2.3 Limiting conditions (ISO 6552)

Maximum operating conditions depend upon orifice size.

Body design conditions			exceeds PN16
PMA	Maximum allowable pressure	22 bar g @ 210 °C	(319 psi g @ 410 °F)
TMA	Maximum allowable temperature	210 °C @ 22 bar g	(410 °F @ 319 psi g)
Designed for a maximum cold hyraulic test pressure of:		34 bar g	(493 psi g)

Note: The pressure limit on the flange type used should be greater than the pressure limit of the internal mechanism (ΔPMX) selected.

ΔPMX - Maximum differential pressure bar

	Size	ΔPMX - Maximum differential pressure bar						
		2	2.5	4	8.5	12.5	13.8	17
Screwed	½"	211/12	-	211/10	211/8	-	211/7	211/6
	¾"	212/16	-	212/12	212/10	-	212/8	212/7
	1"	213/24	-	213/20	213/16	213/14	-	213/12
	1½"	215/36	-	215/28	215/22	215/20	-	215/18
	2"	-	216/48	216/40	216/32	216/28	-	216/24
Flanged	DN15	221/12	-	221/10	221/8	-	221/7	221/6
	DN20	222/16	-	222/12	222/10	-	222/8	222/7
	DN25	223/24	-	223/20	223/16	223/14	-	223/12
	DN40	225/36	-	225/28	225/22	225/20	-	225/18
	DN50	-	226/48	226/40	226/32	226/28	-	226/24

2.4 Dimensions/weights (approximate) in mm and kg

Type		Size	A	B	C	D	Weight
Screwed	Type 211	½"	163	108	178	67	2.8
	Type 212	¾"	200	135	229	93	5.2
	Type 213	1"	269	188	280	114	12.2
	Type 215	1½"	365	238	380	140	27.0
	Type 216	2"	432	286	470	185	43.5
Flanged	Type 221	DN15	215	108	254	-	4.9
	Type 222	DN20	286	135	280	-	9.1
	Type 223	DN25	305	188	305	121	16.3
	Type 225	DN40	370	238	380	140	30.8
	Type 226	DN50	450	286	457	165	49.4

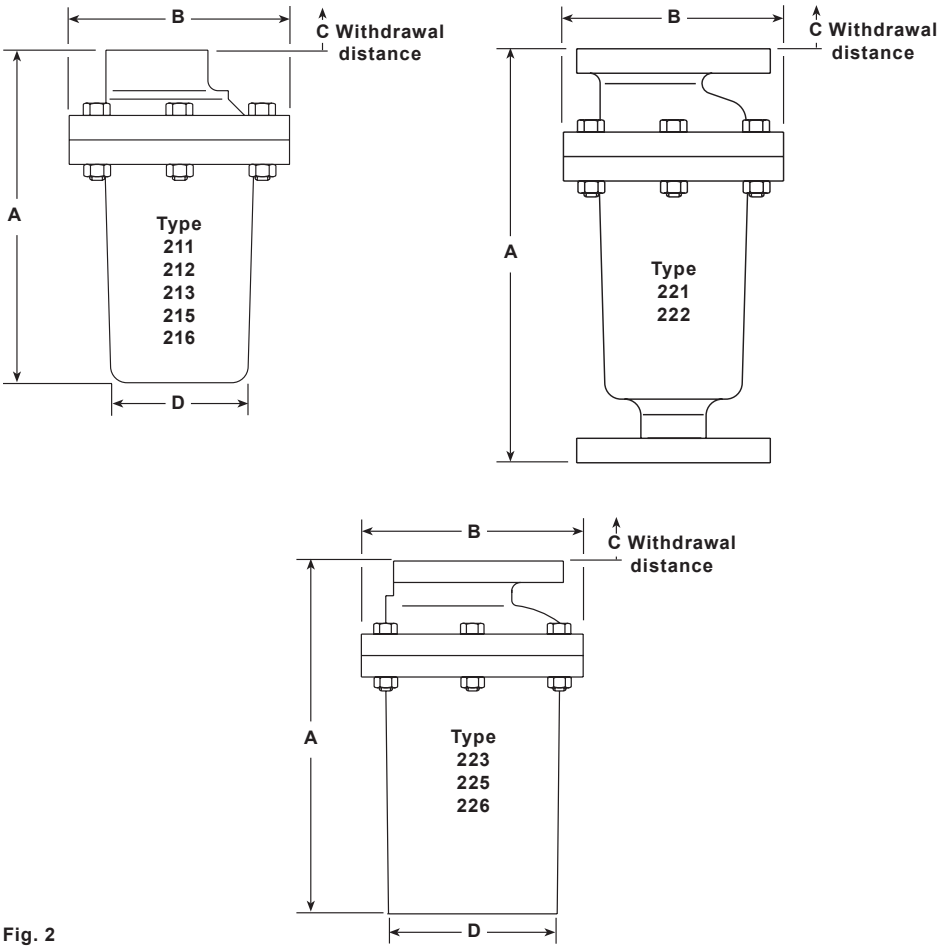

B
C Withdrawal distance
A
Type
211
212
213
215
216
D
B
C Withdrawal distance
A
Type
221
222
B
C Withdrawal distance
A
Type
223
225
226
D

Fig. 2

3. Installation

Note: Before actioning any installation observe the 'Safety information' in Section 1.

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended installation:

3.1 Check materials, pressure and temperature and their maximum values. If the maximum operating limit of the product is lower than that of the system in which it is being fitted, ensure that a safety device is included in the system to prevent overpressurisation.

3.2 Determine the correct installation situation and the correct direction of fluid flow.

3.3 Remove protective covers from all connections.

3.4 The trap must be installed with the body upright so that the bucket is rising and falling vertically. The inlet should be at the bottom with the trap installed below the drain point so that a water seal can be maintained around the open end of the bucket.

Inverted bucket traps do not permit rapid release of air. On process applications, in particular, this can lead to slow warm-up times and waterlogging of the steam space. A separate external air vent is therefore required in parallel to vent air efficiently. Any bypass should be positioned above the trap. If it is below, and is leaking or left open the waterseal could be blown away leading to steam wastage. Where inverted bucket traps are fitted in exposed conditions the possibility of freezing damage can be reduced by thermal insulation.

On some sizes of flanged traps the inlet and outlet flanges are formed from the body and cover castings and therefore have tapped holes to receive studs. The stud holes are tapped UNC for ANSI flanges and tapped metric for BS 4505/DIN flanges. Ensure that you have the required tools available before undertaking installation.

3.5 If the trap is installed on a superheated steam system application, then a non return valve should be fitted on the trap inlet, to prevent the trap from losing its waterseal.

Priming of the trap with water may be required before commissioning.

3.6 Open isolation valves slowly, until normal operating conditions are achieved.

3.7 Check for leaks and correct operation.

Note: If the trap is to discharge to atmosphere ensure it is to a safe place, the discharging fluid may be at a temperature of 100 °C (212 °F).

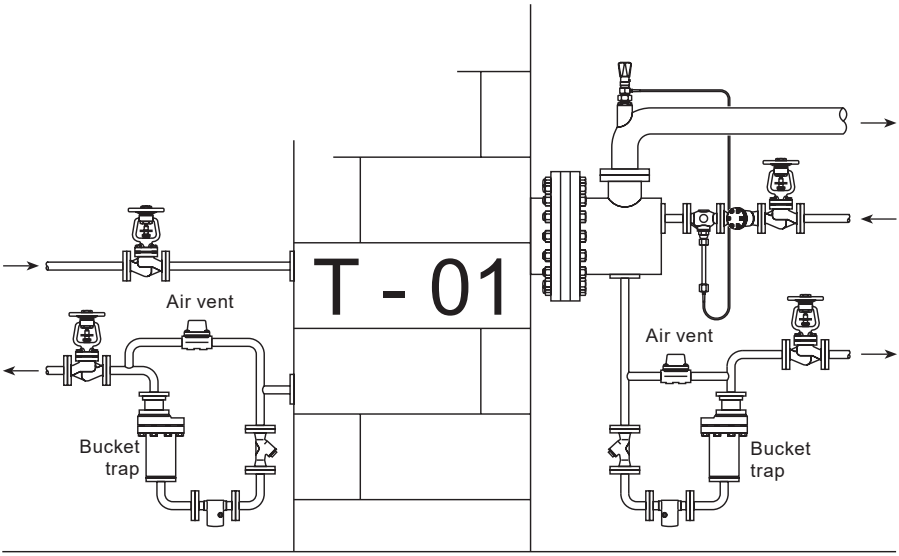


Fig. 3 Typical installation - Oil storage tanks

4. Commissioning

After installation or maintenance ensure that the system is fully functioning. Carry out tests on any alarms or protective devices.

5. Operation

Under most conditions the trap will discharge condensate with a 'blast' type action. Under low load and/or low pressure applications the discharge may tend to 'dribble'.
Condensate is discharged at steam temperature so due care must be given to the site of the discharge.

6. Maintenance

Note: Before actioning any maintenance programme observe the 'Safety information' in Section 1.

Warning

The cover gasket contains a thin stainless steel support ring which may cause physical injury if not handled and disposed of carefully.

It is recommended that new gaskets and spares are used whenever maintenance is undertaken. Ensure that the correct tools and necessary protective equipment are used at all times. When maintenance is complete, open isolation valves slowly and check for leaks.

How to fit the valve and seat assembly

- Isolate the trap and disconnect the outlet connection, open up the trap by undoing the cover nuts (**2**).
- Unhook the bucket (**5**) from the valve lever (**11**).
- Remove the valve seat (**9**).
- Remove the valve guide plate (**7**) by undoing the two screws (**6**).
- Screw in the new valve seat (**9**), using a little Loctate 620 on the threads and making sure that joint faces are clean. See Table 1 for the recommended tightening torques.
- Fix the new valve guide plate (**7**) in position by using new screws (**6**) which are supplied, hook the new valve lever (**11**) over the pins (part of the valve guide plate) and centralise the valve to the orifice and tighten the screws (see Table 1 for the recommended tightening torques).
- Refit the cover using new gasket, tighten cover nuts (**2**) to the recommended tightening torque figures shown in Table 1 and reconnect the outlet pipework.
- Open the isolation valve slowly and check for leaks.

Note: In some earlier models of the 212 and 222 trap the hooks on the guide plate were reversed. This no longer applies and the standard guide plate (**7**) as shown is the correct replacement.
This also applies to the spares which are still available for the obsolete 214 and 224 traps.

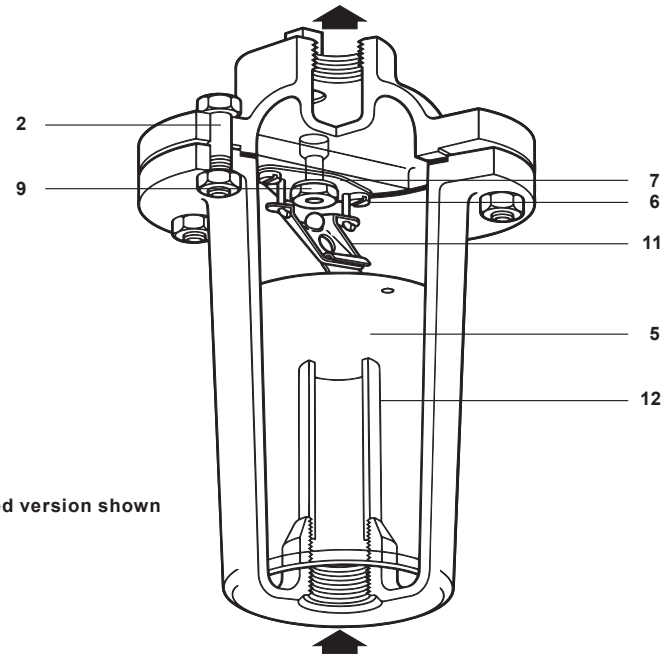


Fig. 4 Screwed version shown

Table 1
Recommended tightening torques

Item No	Size of trap	 or mm 	N m	(lbf ft)
2 (6 off)	½" - DN15	M8 x 35	18 - 22	(13 - 16)
2 (8 off)	¾" - DN20	M10 x 40	16 - 20	(12 - 15)
2 (10 off)	1" - DN25	M12 x 60	24 - 28	(18 - 21)
2 (12 off)	1½" - DN40	M16 x 75	60 - 66	(44 - 32)
2 (12 off)	2" - DN50	M16 x 75	64 - 70	(47 - 51)
6	½" - DN15	2BA x 5/16"	4 - 5	(3 - 4)
	¾" - DN20	2BA x 5/16"	4 - 5	(3 - 4)
	1" - DN25	¼" WHIT x ½"	10 - 12	(7 - 9)
	1½" - DN40	¼" WHIT x ½"	10 - 12	(7 - 9)
	2" - DN50	5/16" WHIT x ½"	14 - 16	(10 - 12)
9	½" - DN15	½" A/F	23 - 27	(17 - 20)
	¾" - DN20	5/8" A/F	40 - 44	(29 - 32)
	1" - DN25	7/8" A/F	80 - 88	(59 - 65)
	1½" - DN40	1¼" A/F	175 - 190	(129 - 140)
	2" - DN50	1½" A/F	270 - 300	(199 - 220)
12	½" - 2" DN15 - DN50	1½" A/F	60 - 70	(44 - 51)

7. Spare parts

The spare parts available are shown in heavy outline. Parts shown in a grey line are not supplied as spares.

Available spares

Valve and seat assembly (state pressure range)	**6** (2 off), **7**, **9**, **11**
Bucket	**5**
Internal tube	**12**
Cover gasket (packet of 3)	**8**

How to order spares
Always order spare parts by using the description given in the column headed 'Available spares' and state the size and full definition of the trap eg. 223/16.

Example: 1 - Valve and seat assembly for a Spirax Sarco DN25, 223/16 (having a ΔPMX of 8.5 bar g) cast iron inverted bucket steam trap.

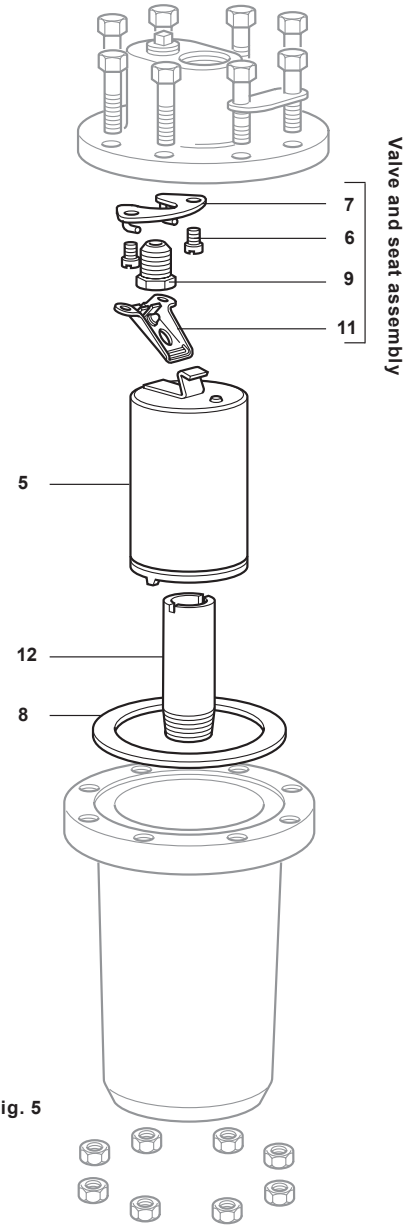


Fig. 5