

## CSD - CSE - CSF Series Inverted bucket steam traps Installation and Maintenance Instructions

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The PED Directive 97/23/EC is repealed and replaced by the new  
**PED Directive 2014/68/EU** with effect from 19 July 2016.



- 1. General safety information*
- 2. General product information*
- 3. Installation*
- 4. Commissioning*
- 5. Operation*
- 6. Maintenance*
- 7. Spare parts*



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# ATTENZIONE

## Lavorare in sicurezza con apparecchiature in ghisa e vapore

### **Working safely with cast iron products on steam**

Informazioni di sicurezza supplementari - *Additional Informations for safety*

#### **Lavorare in sicurezza con prodotti in ghisa per linee vapore**

I prodotti di ghisa sono comunemente presenti in molti sistemi a vapore.

Se installati correttamente, in accordo alle migliori pratiche ingegneristiche, sono dispositivi totalmente sicuri.

Tuttavia la ghisa, a causa delle sue proprietà meccaniche, è meno malleabile di altri materiali come la ghisa sferoidale o l'acciaio al carbonio.

Di seguito sono indicate le migliori pratiche ingegneristiche necessarie per evitare i colpi d'ariete e garantire condizioni di lavoro sicure sui sistemi a vapore.

#### **Movimentazione in sicurezza**

La ghisa è un materiale fragile: in caso di caduta accidentale il prodotto in ghisa non è più utilizzabile. Per informazioni più dettagliate consultare il manuale d'istruzioni del prodotto.

Rimuovere la targhetta prima di effettuare la messa in servizio.

#### **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.*

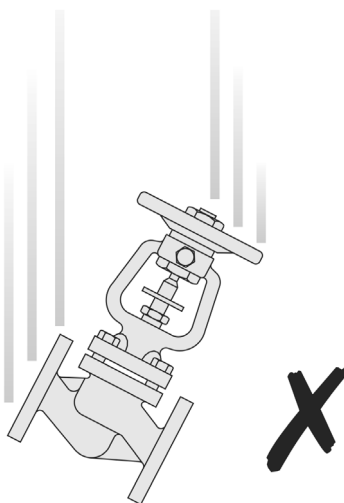
*However, because of its mechanical properties, it is less forgiving compared to other materials such as SG iron or carbon steel.*

*The following are the good engineering practices required to prevent waterhammer and ensure safe working conditions on a steam system.*

#### **Safe Handling**

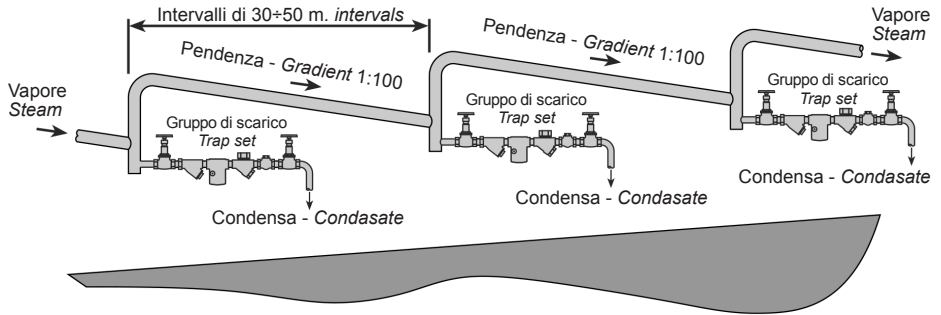
*Cast iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.*

*Please remove label before commissioning*

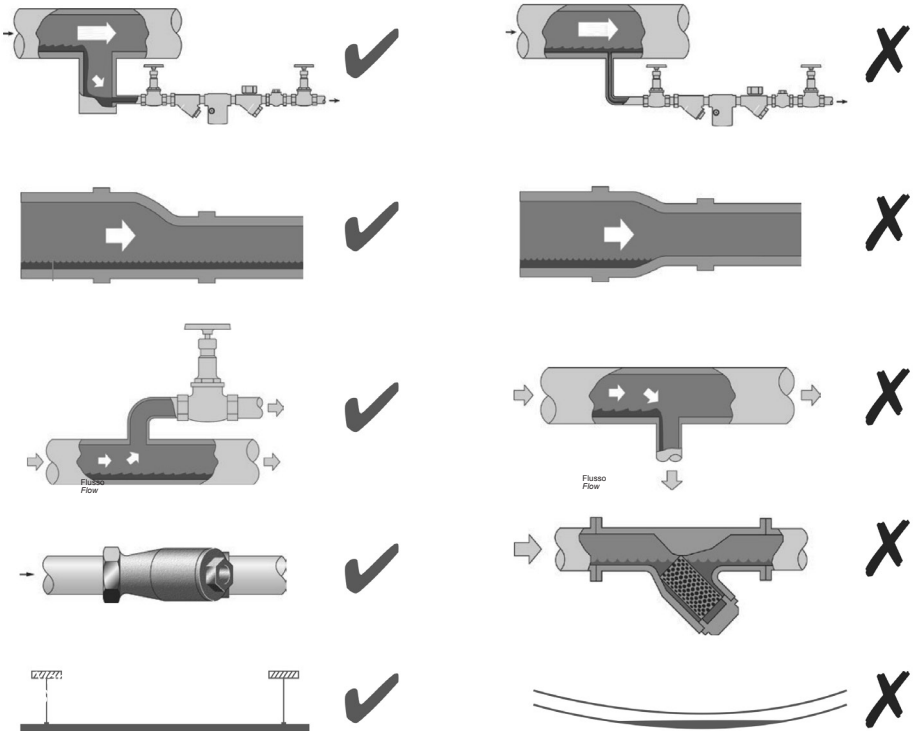


# Prevenzione dai colpi d'ariete - *Prevention of water hammer*

Scarico condensa nelle linee vapore - *Steam trapping on steam mains:*



## Esempi di esecuzioni corrette (✓) ed errate (✗) sulle linee vapore: *Steam Mains - Do's and Don't's:*



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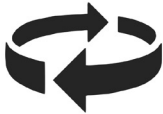
## Prevenzione delle sollecitazioni di trazione

### ***Prevention of tensile stressing***

Evitare il disallineamento delle tubazioni - *Pipe misalignment*:

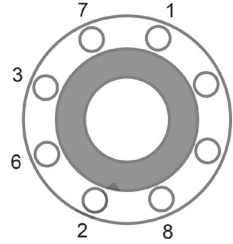
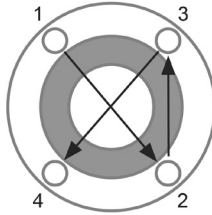
**Installazione dei prodotti o loro rimontaggio post-manutenzione:**

***Installing products or re-assembling after maintenance:***



Evitare l'eccessivo serraggio.  
Utilizzare le coppie di serraggio  
raccomandate.

*Do not over tighten.  
Use correct torque figures.*



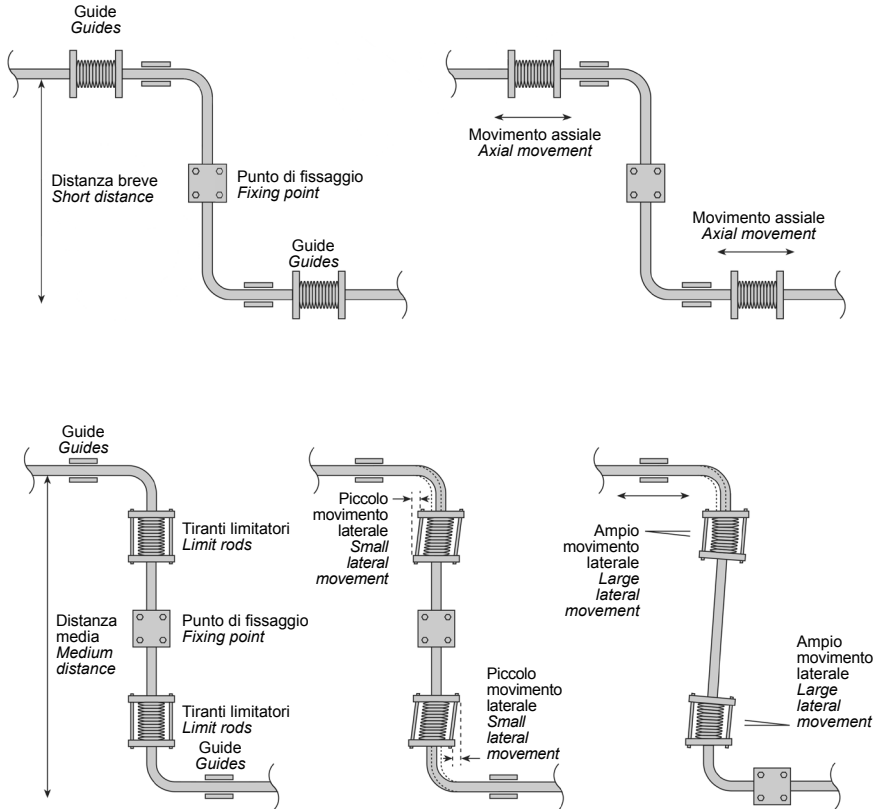
Per garantire l'uniformità del carico e dell'allineamento,  
i bulloni delle flange devono essere serrati in modo  
graduale e in sequenza, come indicato in figura.

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

## Dilatazioni termiche - *Thermal expansion:*

Gli esempi mostrano l'uso corretto dei compensatori di dilatazione. Si consiglia di richiedere una consulenza specialistica ai tecnici dell'azienda che produce i compensatori di dilatazione.

*Examples showing the use of expansion bellows. It is highly recommended that expert advise is sought from the bellows manufacturer.*



# 1. General 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. These products comply with the requirements of the European Pressure Equipment Directive 97/23/EC and carry the CE mark when so required. The products fall within the following Pressure Equipment Directive categories:

Product		Group 1 Gases	Group 2 Gases	Group 1 Liquids	Group 2 Liquids
CSD	DN 25	-	SEP	-	SEP
CSE	DN 40	-	1	-	SEP
CSF	DN 50	-	1	-	SEP

- I) These products have been specifically designed for use on steam, air or condensate /water, which is 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.

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## 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 very high temperatures (400°C). 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 the specific details relating to the product in the following "Maintenance" section.

## 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.



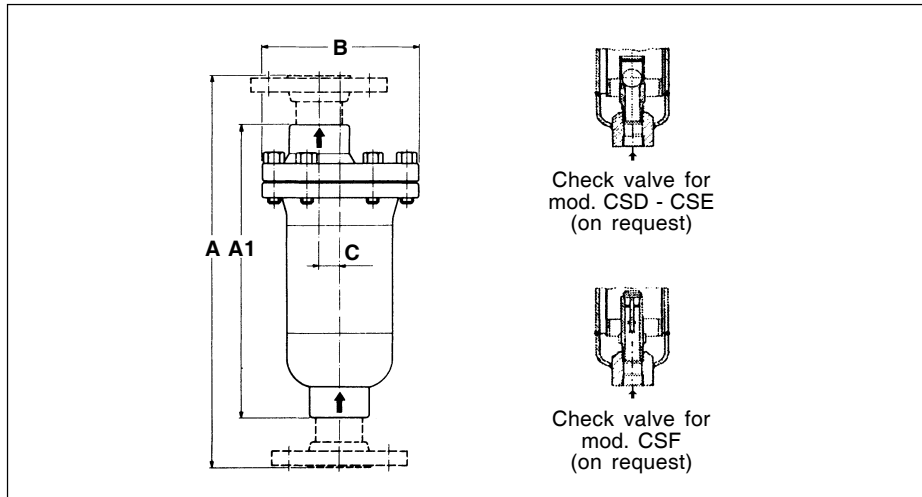
## 2. General product information

### 2.1 General description

CSD, CSE and CSF series steam traps are particularly recommended for use with saturated and superheated steam on medium/high consumption process systems, including those fitted with pressure or temperature control.

The variable fulcrum arm system allows the use of large discharge valve seats with high capacities.

### Dimensions (mm) and approximate weight (kg)



Mod.	A1		A					B	C
	NPT	SW	UNI PN40	UNI PN100	ANSI 150	ANSI 300	ANSI 600		
<b>CSD</b> kg	305 12	316 12	400 15	500 17	400 14	430 15	430 16	165	30
<b>CSE</b> kg	365 16,5	370 16,5	460 22	550 25	460 20	500 23	500 24	200	30
<b>CSF</b> kg	470 31	485 31	586 37	675 43	586 36	620 39	620 39	250	40

### 2.2 Sizes and pipe connections

Series		CSD		CSE		CSF	
<b>Connections and sizes</b>	screwed	1"	NPT (ANSI B1.20.1)	1½"	NPT (ANSI B1.20.1)	2"	NPT (ANSI B1.20.1)
	socket weld	1"	SW (ANSI B16.11)	1½"	SW (ANSI B16.11)	2"	SW (ANSI B16.11)
	flanged	DN 25	PN 40/64/100 (UNI 2223/2229) (DIN 2501/2526)	DN 40	PN 40/64/100 (UNI 2223/2229) (DIN 2501/2526)	DN 50	PN 40/64/100 (UNI 2223/2229) (DIN 2501/2526)
		1"	150/300/600 RF (ANSI B16.5)	1½"	150/300/600 RF (ANSI B16.5)	2"	150/300/600 RF (ANSI B16.5)

## 2.3 Limiting conditions

<b>Body design conditions</b>	PMA: 51 bar g at 350°C - TMA: 427°C at 35 bar g. In the flanged option, these values may be limited by the maximum conditions allowable for the flanges installed.
	Minimum allowable temperature -10°C

Maximum values may be limited by the rating of the flanges installed

## 2.4 Operating conditions

	Model	PMO	ΔPMX	Model	PMO	ΔPMX	Model	PMO	ΔPMX
<b>Maximum operating temperature (TMO: 427°C) and Maximum operating pressure (PMO) and Maximum differential pressures (ΔPMX)</b>	CSD 35	35 bar g	35	CSE 35	35 bar g	35	CSF 40	40 bar g	40
	CSD 25		25	CSE 25		25	CSF 35		35
	CSD 18		18	CSE 18		18	CSF 25		25
	CSD 12		12	CSE 12	15 bar g	12	CSF 20	20	
	CSD 8		8	CSE 8		8	CSF 15	15	
	CSD 4		4	CSE 4	6 bar g	4	4	CSF 10	20 bar g
	CSD 2	2	CSE 2	2			CSF 6	6	
								CSF 3	5 bar g
									2
									1
<b>On request</b>	Connections with measurements different from the standard Stainless steel check valve incorporated (see design overleaf)								
<b>Minimum operating temperature</b>	0°C								

Pressure and temperatures according to ISO 6552.

Operating values may be limited by the rating of the flanges installed.

## 2.5 Materials

<b>Materials</b>	Body and cover	Carbon steel (ASTM A106 Gr. B et A105)
	Valve seat and valve	Stainless steel (AISI 440 C)
	Bucket and linkages	Stainless steel (AISI 304)
	Gasket	Asbestos-free synthetic fibre

## 2.6 Condensate discharge capacities (kg/h)

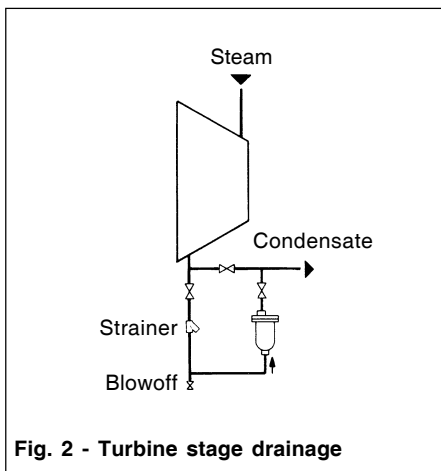
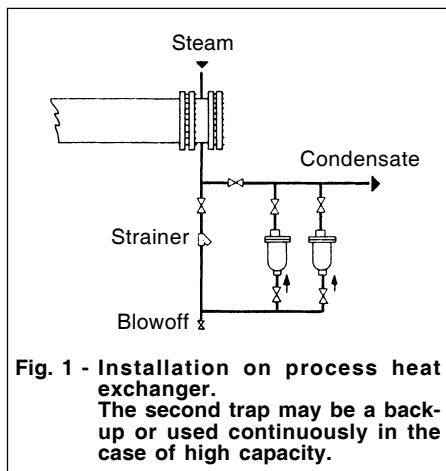
Model	Differential pressure (bar)												
	1	2	4	8	12	14	18	20	25	28	35	40	
CSD	35	245	380	570	880	1100	1200	1400	1600	1750	1850	2050	-
	25	300	480	730	1150	1500	1700	1900	2000	2350	-	-	-
	18	405	620	1000	1550	2000	2200	2700	-	-	-	-	-
	12	540	840	1350	2050	2800	-	-	-	-	-	-	-
	8	680	1100	1850	2950	-	-	-	-	-	-	-	-
	4	1000	1800	2900	-	-	-	-	-	-	-	-	-
	2	1750	2900	-	-	-	-	-	-	-	-	-	-
CSE	35	380	590	1000	1350	1900	1950	2200	2550	2900	3050	3600	-
	25	470	710	1150	1900	2200	2650	3050	3200	3850	-	-	-
	18	650	1000	1750	2700	3450	3900	4800	-	-	-	-	-
	12	800	1300	2150	3600	4900	-	-	-	-	-	-	-
	8	1100	1900	3050	5150	-	-	-	-	-	-	-	-
	4	1850	3050	5300	-	-	-	-	-	-	-	-	-
	2	2700	5000	-	-	-	-	-	-	-	-	-	-
CSF	40	1300	1750	2350	3250	3900	4200	4700	5000	5300	5400	6400	6800
	35	1700	2100	2800	3800	4700	4950	5500	5800	6400	6700	7500	-
	25	2100	2700	3650	4800	5800	6350	7000	7300	8000	-	-	-
	20	2600	3300	4500	5900	6900	7200	8000	8500	-	-	-	-
	15	3000	4100	5300	7200	8800	9100	-	-	-	-	-	-
	10	3800	5000	6800	8600	-	-	-	-	-	-	-	-
	6	4800	6500	8200	-	-	-	-	-	-	-	-	-
	3	7000	8900	-	-	-	-	-	-	-	-	-	-
	2	9000	11000	-	-	-	-	-	-	-	-	-	-
	1	11000	-	-	-	-	-	-	-	-	-	-	-

**Note:** Recommended safety factors; continuous operation 1.5, intermittent operation from 2 to 3.

## 3. Installation

It is essential that installation is carried out correctly, observing the instructions given below. Do not let foreign bodies cause the steam trap to malfunction and put it out of service in a short time; flush out pipes before the start up.

- 3.1** Check that the trap is suitable for the effective maximum differential pressure ("PMX) and operating pressure (PMO) in the system.
- 3.2** Install the trap only vertically with the cover at the top (inlet at the bottom and exit from the top).
- 3.3** The use of an upstream protection strainer is always recommended, and it is better if preceded by a separation pocket with blowoff valve (Fig. 1 and 2), especially in the presence of dirty or high pressures.
- 3.4** If the trap is used at maximum capacity, the piping downstream of the trap needs to be the proper size. Generally speaking, one or two DN above the trap connection is enough.
- 3.5** With very low steam capacities and/or superheated steam, it is advisable to install a check valve upstream or inbuilt in the trap. Prime the trap by pouring water (circa 0.5 - 1 litres for CSD and CSE, 3 litres for CSF) into the body of the trap, introducing it from the top connection, before connecting the trap to the network.
- 3.6** If the system is required to operate on a continuous basis, arrange for a shut-off valve to be installed upstream and a bypass; add a downstream valve in the case of piped return line.
- 3.7** In the case of a raised condensate return system, a check valve should be fitted downstream of the trap (unless it is already installed upstream or incorporated as at point 3.5).



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## 4. Commissioning

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

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## 5. Operation

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Operation is completely automatic for the removal of both air and incondensable gases, which, if present in large quantities, may also require the installation of an air eliminator in parallel. The special valve lever-bucket connection eliminates all friction with the side wall: closure is instantaneous, without steam leaks and operation is with blast type discharges, easily measurable to check trap operation.

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## 6. Maintenance

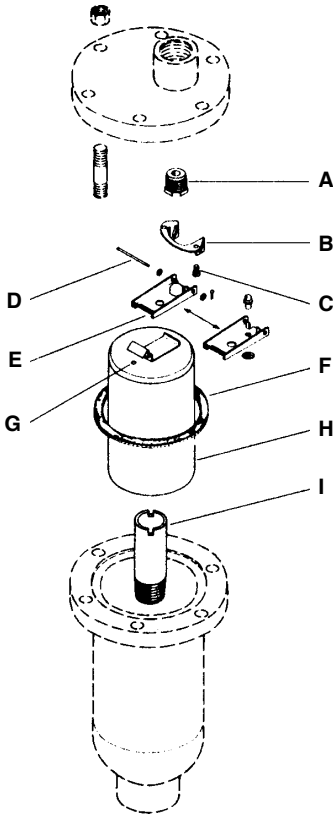
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**Before undertaking any maintenance on the trap it must be isolated from both the supply line and return line and any pressure allowed to safely normalise to atmosphere. The trap should then be allowed to cool. When reassembling, ensure that all joint faces are clean.**

- 6.1** For a complete inspection of the trap, remove the cover by unscrewing the bolts. Clean the valve mechanism of any deposits and fouling, and ensure that the air vent hole (G) in the bucket is completely free of obstructions.
- 6.2** To replace the valve seat, remove the valve mechanism by unscrewing the two screws (C). When replacing the valve seat, it is also advisable to replace the valve plug/lever assembly (E), which is removed by undoing the split-pin (D). It is also advisable to replace the cover gasket (F).
- 6.3** To replace the bucket (H) slip off the top bucket hook from the lever.

## 7. Spare parts

The available parts are indicated in the table and can be seen in the drawing. They are available according to the groupings given in the table. No other parts can be supplied as a spare part.



- A = Valve seat
- B = Bracket
- C = Bracket screws
- D = Lever pin
- E = Lever with valve plug
- F = Cover gasket
- G = Hole
- H = Bucket
- I = Inlet tube

<b>Available spares</b>	
<b>Valve and seat assembly Parts A - B - C - D - E - F</b>	
CSD	2
	4
	8
	12
	18
	25
CSE	35
	2
	4
	8
	12
	18
CSF	25
	35
	1
	2
	3
	6
	10
	15
	20
	25
35	
40	
<b>Bucket assembly Parts F - H</b>	
CSD	2
	4/35
CSE	2/4
	8/12
CSF	18/35
	1
	6/15
20/40	
<b>Gasket set Part F (3)</b>	
CSD	
CSE	
CSF	

### How to order spares

Always order spare parts by using the description given in the table and state the type of trap, pressure rating and diameter of the connections.

**Example:** 1 - Valve assembly for a CSF 6 trap, DN 2".



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#### REPAIRS

Please contact our nearest Branch Office or Agent, or directly Spirax-Sarco S.r.l.

Via per Cinisello, 18 - 20834 Nova Milanese (MB) – ITALY - Tel.: +39 0362 49 17.1 - Fax: +39 0362 49 17 307

#### LOSS OF GUARANTEE

**Total or partial disregard of above instructions involves loss of any right to guarantee.**

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**Spirax-Sarco S.r.l.** - Via per Cinisello, 18 - 20834 Nova Milanese (MB) - Tel.: 0362 49 17.1 - Fax: 0362 49 17 307