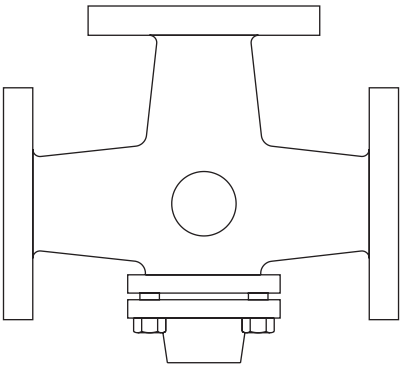
IM-P047-04
CH Issue 8

spirax sarco

TW
Temperature Control Valve
Installation and Maintenance Instructions



1. Safety information

Safe operation of this 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. The products listed below 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 2 Liquids
TW	Bronze	DN20 - DN40	SEP
		DN50	SEP
	Cast iron	DN50	SEP
		DN80 - DN100	SEP

i) The products have been specifically designed for use on water and other non-hazardous liquids 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 of 200°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 Disposal

The product is recyclable. No ecological hazard is anticipated with the disposal of this product providing due care is taken. EXCEPT;

PTFE:

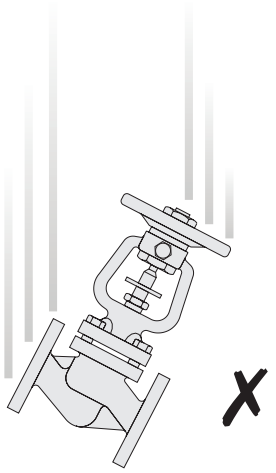
- **Can only be disposed of by approved methods, not incineration.**
- **Keep PTFE waste in a separate container, do not mix it with other rubbish, and consign it to a landfill site.**

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.

1.17 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.

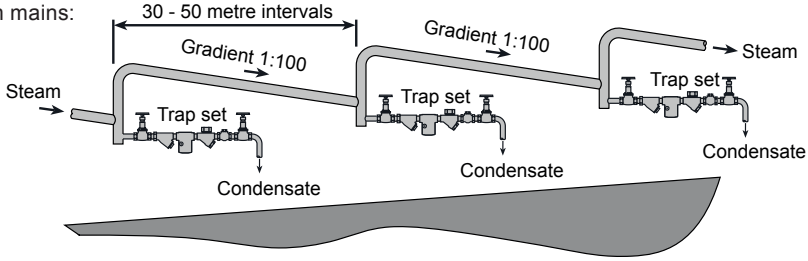


Safe Handling

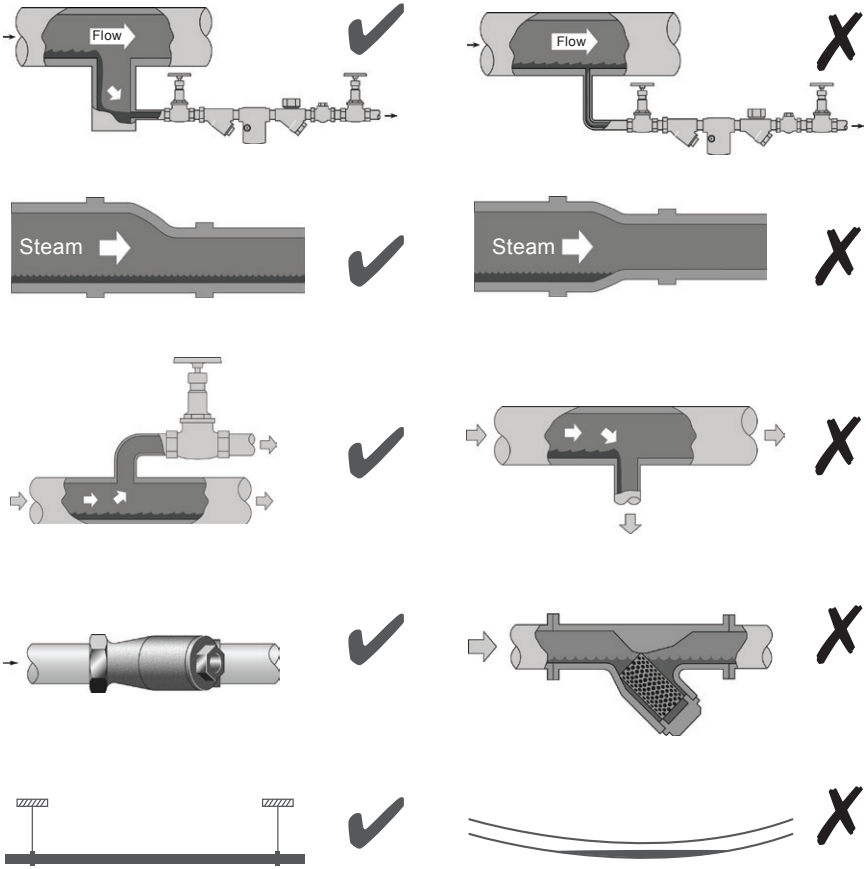
Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.

Prevention of water hammer

Steam trapping
on steam mains:

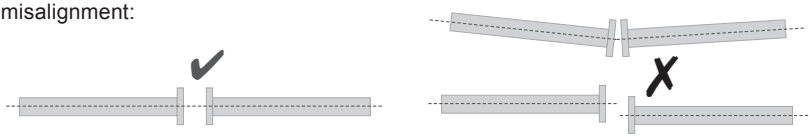


Steam Mains - Do's and Don'ts:

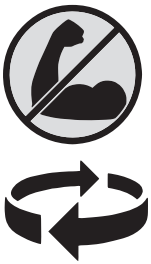


Prevention of tensile stressing

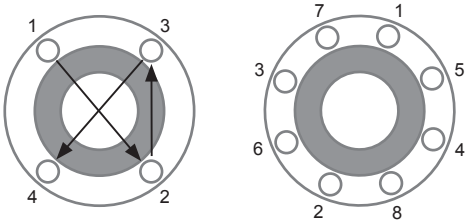
Pipe misalignment:



Installing products or re-assembling after maintenance:

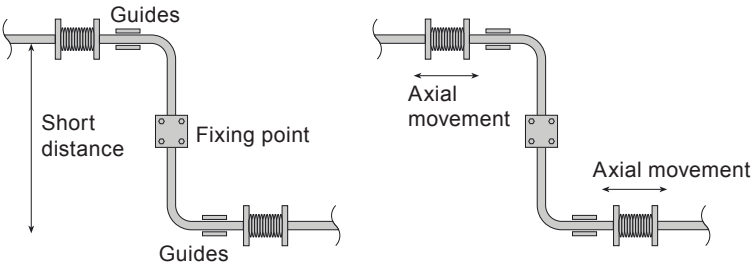


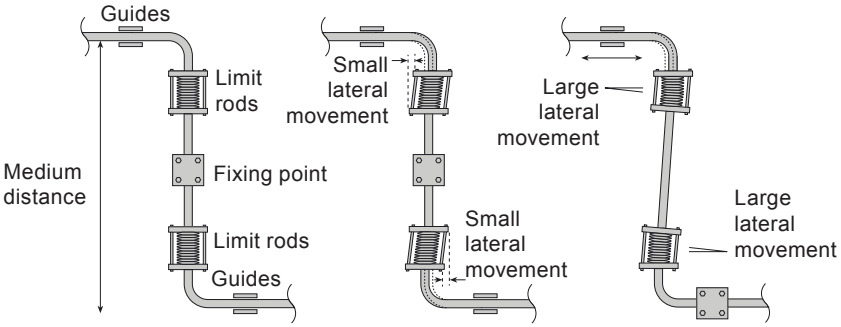
Do not over tighten.
Use correct torque figures.



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 TW valve is a 3-port valve for liquid systems (including sea water) and can be used for mixing or diverting applications.

Available types

Bronze valves	Screwed	¾", 1" and 1½"
	Flanged	DN50
Cast iron valves	Flanged	DN50, DN80 and DN100

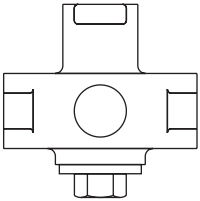


Fig. 1 Screwed

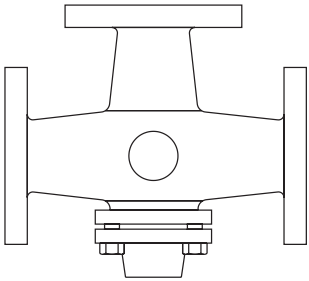


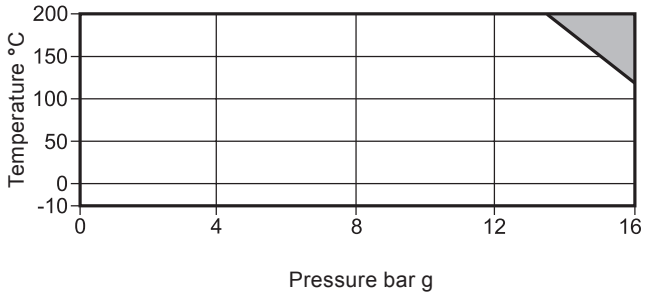
Fig. 2 Flanged

2.2 Sizes and pipe connections

Bronze valves	¾", 1" and 1½" screwed BSP (BS 21 parallel) or NPT. DN50 standard flange EN 1092 PN25 which also meets the face-to-face dimensions of Table 16 and Table 10.
Cast iron valves	DN50, DN80 and DN100 standard flange EN 1092 PN16 which also meets the face-to face dimensions of Table 10.

2.3 Pressure/temperature limits

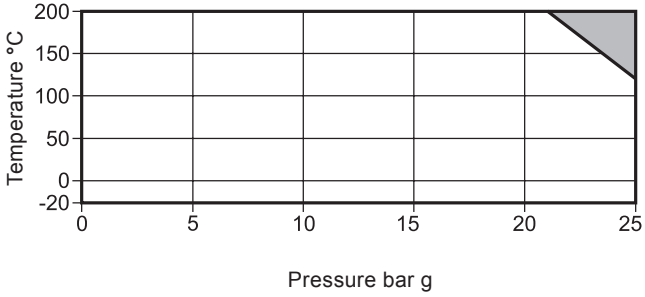
Cast iron valves - flanged PN16



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

Body design conditions		PN16
Maximum design pressure		16 bar g @ 120°C
Maximum design temperature		200°C @ 13.5 bar g
Minimum design temperature		-10°C
Maximum operating temperature		200°C @ 13.5 bar g
Minimum operating temperature **Note:** For lower operating temperatures consult Spirax Sarco.		-10°C
Maximum differential pressure	¾", 1" and 1½"	3.4 bar
	DN50, DN80 and DN100	2.7 bar
Designed for a maximum cold hydraulic test pressure of:		24 bar g
Maximum test pressure		16 bar g
Leakage rate		1% of full K_V (see Section 2.4, K_V values)

Bronze valves - screwed and flanged PN25



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

Body design conditions		PN25
Maximum design pressure		25 bar g @ 120°C
Maximum design temperature		200°C @ 21 bar g
Minimum design temperature		-90°C
Maximum operating temperature		200°C @ 21 bar g
Minimum operating temperature **Note:** For lower operating temperatures consult Spirax Sarco.		-20°C
Maximum differential pressure	¾", 1" and 1½"	3.4 bar
	DN50, DN80 and DN100	2.7 bar
Designed for a maximum cold hydraulic test pressure of:		37.5 bar g
Maximum test pressure		25 bar g
Leakage rate		1% of full K_V (see Section 2.4, K_V values)

2.4 Kv values

Size	¾"	1"	1½"	DN50	DN80	DN100
K_V	4.64	8.96	20.29	41.20	97.85	118.45

For conversion: Cv (UK) = Kv x 0.97 Cv (US) = Kv x 1.17

2.5 Sizing For water see TI-GCM-09.

2.6 Materials

No.	Part		Material	
1	Body		Bronze	CC 491 KM
			Cast iron	EN GJL 250
2	Piston		Bronze	BS 1400 LG2
3	Piston sealing ring		Carbon impregnated PTFE	
4	Stem	DN20 - DN40	Brass	BS 2874 CZ 121
		DN50 - DN100	Bronze	
5	Spacer piece		Bronze	BS 2874 PB 102
6	Lock-nut		Bronze	BS 2874 PB 102
7	Return spring		Stainless steel	BS 2056 302 S26
8	Return spring cover	DN20 - DN40	Brass	BS 2874 CZ 121
		DN50 - DN100	Bronze	BS 2874 BP 102
9	Cover		Bronze	CC 491 KM
			Cast iron	EN GJL 250
10	Cover sealing ring		Reinforced exfoliated graphite	
11	Bonnet	DN20 - DN25	Brass	CW 617N
		DN40 - DN100	Bronze	CC 491 KM
12	Bonnet gasket		Nickel reinforced exfoliated graphite	
13	Cover studs		Steel 7/16" UNF x 1⅜" (35 mm)	BS 2693/1
	Cover nuts		Steel	BS 1768/R
14	Back seal		Bronze	BS 2874 PB 102
15	Split pin		Phosphor bronze	

Fig. 3 Bronze valve

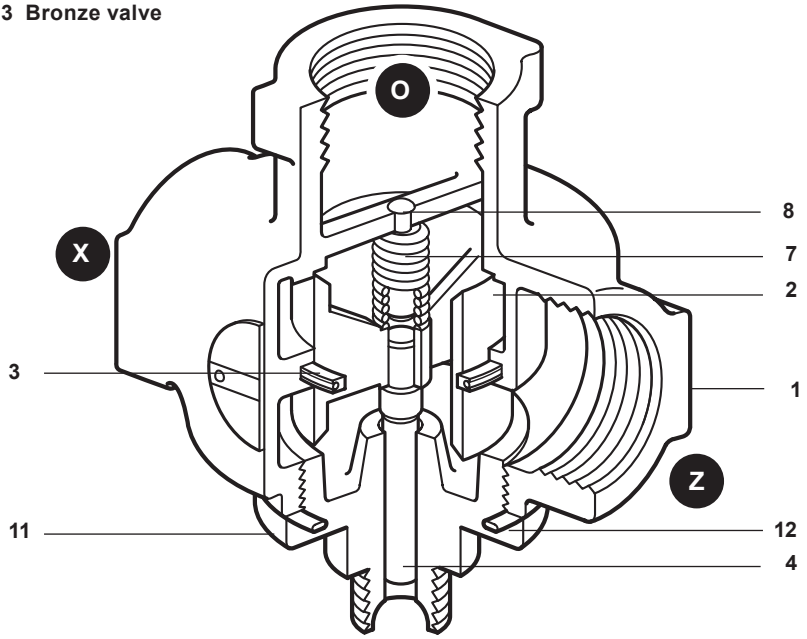
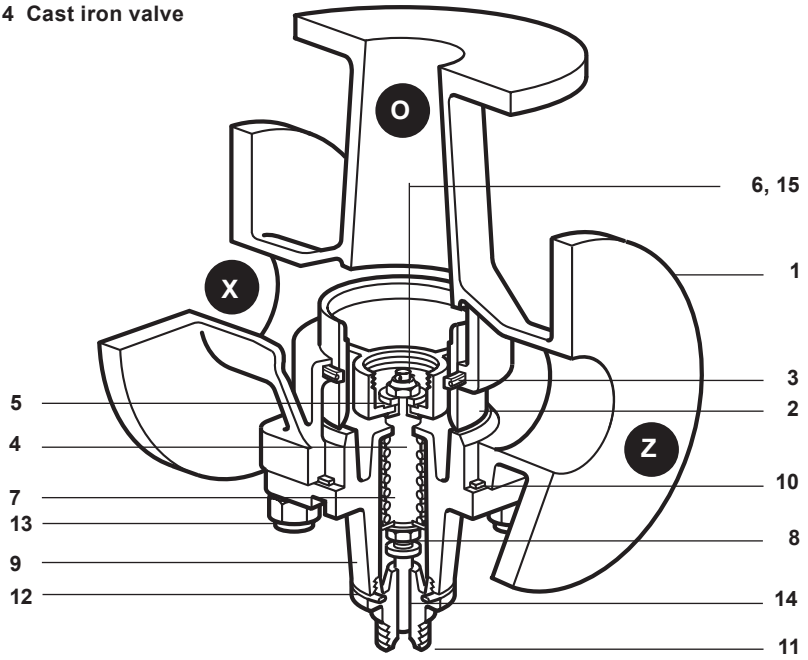


Fig. 4 Cast iron valve



2.7 Dimensions/weights (approximate) in mm and kg

Bronze screwed

Size	A	B	C	Weight
¾"	97	54	58	1.2
1"	114	57	61	1.9
1½"	151	70	76	3.8

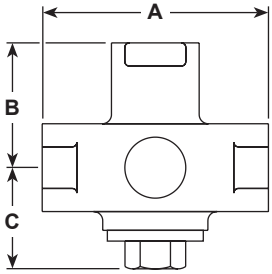


Fig. 5 Screwed

Bronze flanged PN25

Size	A	B	C	Weight
DN50	201	144	133	15.0

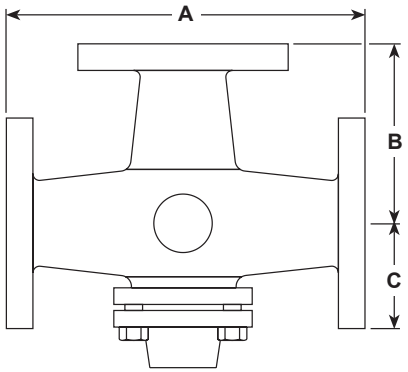


Fig. 6 Flanged

Cast iron flanged PN16

Size	A	B	C	Weight
DN50	219	153	133	13.7
DN80	250	176	135	25.0
DN100	351	151	140	32.0

3. Installation

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

3.1 Important information

TW valves are for use only with SA control systems or electonic actuators of the following types:-

Valve size	Control system/actuator	
DN20 and **DN25**	SA controls	SA121, SA122, SA123 and SA128
	EL actuators	EL3501, EL3502 and EL312 + EL3808 linkage kit
DN40 and **DN50**	SA controls	SA121 and SA123
	EL actuators	EL3501, EL3502 and EL3512 + EL3808 linkage kit
DN80 and **DN100**	SA contols	SA1219 and SA1239
	EL actuators	EL3501, EL3502 and EL3512 + EL3809 linkage kit

The 3 valve ports on the TW valve are marked **X**, **Z** and **O**. The valve should always be fitted in a horizontal pipeline with the actuator vertically below the line as shown in the installation layout diagrams, Section 3.2.
Isolating valves should be fitted to enable maintenance work (should it become necessary) to be carried out without emptying down the plant.
It is important that line stresses such as can be caused by expansion or inadequate supporting of the pipeline are not imposed on the valve body.
It is advisable to protect the valve by fitting a strainer on each inlet pipeline close to the valve.

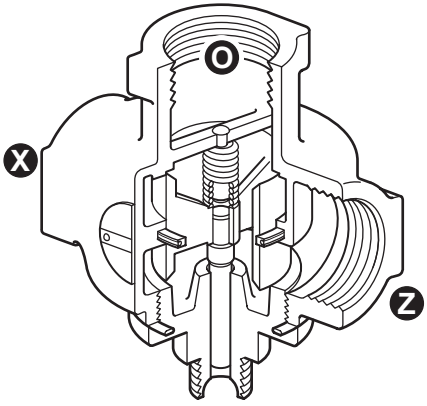


Fig. 7 Bronze valve

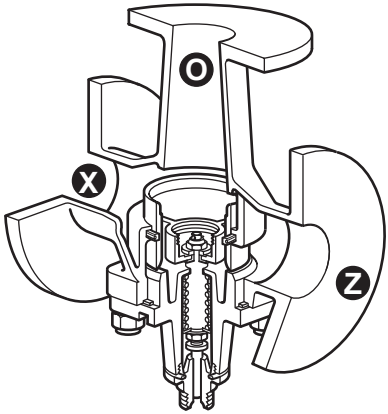


Fig. 8 Cast iron valve

3.2 Installation layout diagrams - some typical examples

Important note: Irrespective of whether the valve is mixing or diverting, heating or cooling, Port '**O**' is always open. Port '**X**' closes with a rise in temperature (SA control system) or an extension of the actuator spindle (EL control).

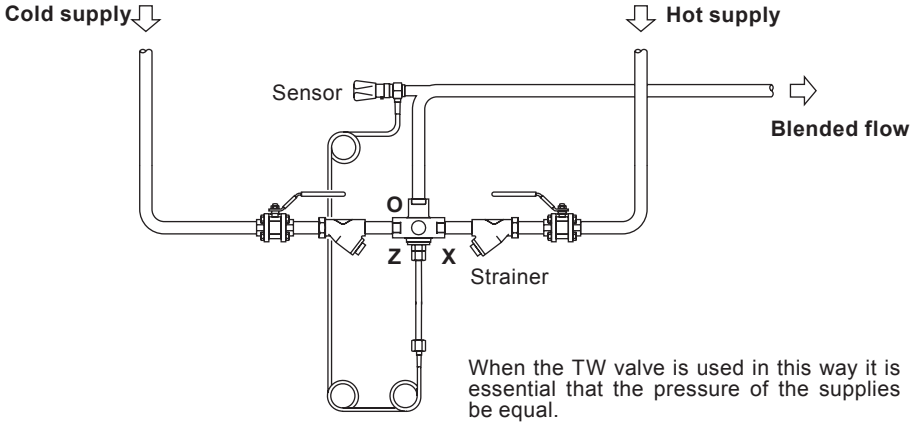


Fig. 9 As a blender for process hot water

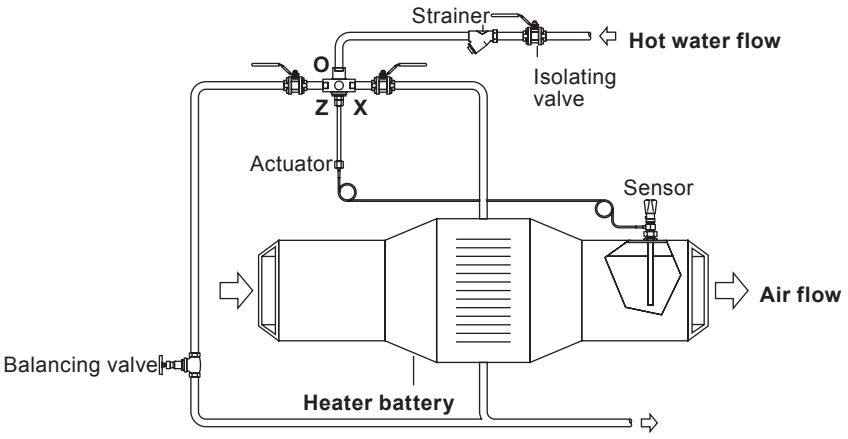


Fig. 10 As a diversion valve - Heating

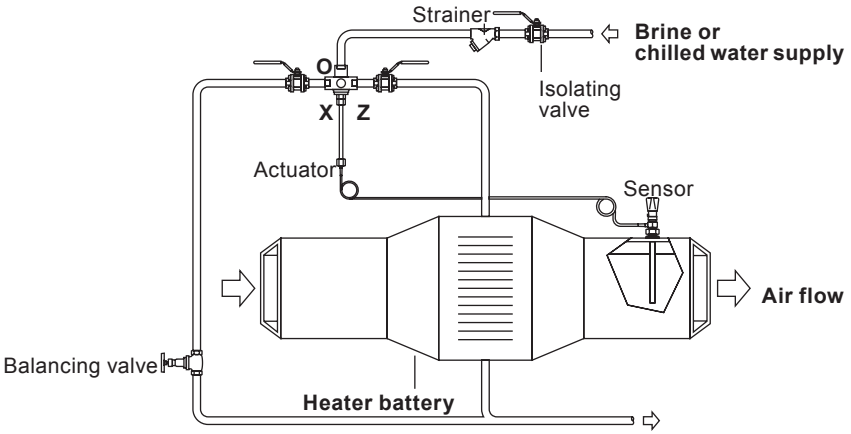


Fig. 11 As a diversion valve - Cooling - Brine or chilled water

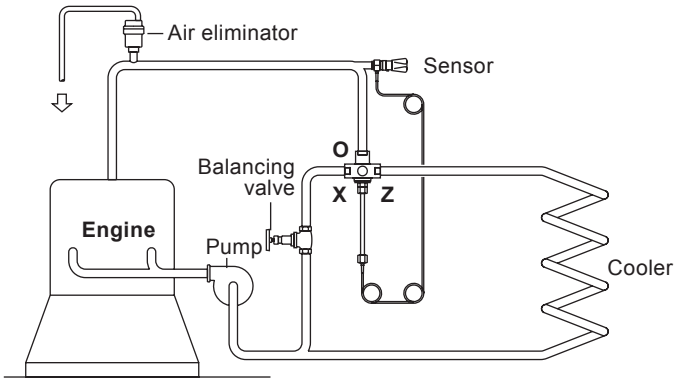


Fig. 12 As a diversion valve - Cooling - Diesel engines or compressors

4. Maintenance

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

4.1 General note

The strainers, if fitted as recommended, should be cleaned at regular intervals to ensure that the flow to the valve is clear and unrestricted.

4.2 Warning

Before attempting to carry out any repairs make sure that the valve is fully isolated and disconnect the actuator coupling from the valve at the union.
Always renew the parts in complete assemblies or sets as listed in Section 5, 'Spare parts' and make sure that all joint faces are clean.
Use the new gasket provided with the spare parts and lightly coat with a suitable jointing paste.

4.3 How to replace the piston sealing ring (refer to Figure 11)

(Piston set and piston sealing ring set):

1. Unscrew the bonnet (**11**) or undo the 4 cover nuts (**13**) and withdawer the complete piston and bonnet assembly.
2. Remove the piston sealing ring (**3**) from the recess in the body and clean the recess.
3. The replacement ring is of carbon impregnated PTFE with a steel backing ring and is a replacement for all previous types of ring.
4. The ring should be fitted so that the chamferred edge **X** is facing the cover of the valve.
5. Allow the ends of the ring to overlap as **Y**. Place an end into the recess in the body and feed the ring into place by pressing outwards.
6. Using the new gasket (**10**) or (**12**) lightly coated with jointing paste fit the new piston and bonnet assembly into the body taking care not to damage the piston sealing ring (**3**).
7. Reconnect the actuator to the bonnet.

Piston set (DN50 - DN100)
Firstly follow steps 1 - 5 above then:

8. Remove the bonnet complete with gasket (**10**) and back seal.
9. With the stem push rod held in a box spanner 16 mm (0.6") A/F remove the split pin (**15**), lock-nut (**6**) and spacer (**5**). Remove the piston (**2**) and replace with the new one, compressing the return spring by using the box spanner on the stem enabling the new lock-nut (**6**), spacer (**5**) and split pin (**15**) to be fitted into place.
10. Reassemble as Steps (**6**) and (**7**) above.

5. Spare parts

The spare parts are shown in heavy outline. Parts drawn in broken line are not available as spares.

Available spares

Piston sealing ring set	¾" to 1½"	**3**, **7**, **12**
	DN50 to DN100	**3**, **10**, **12**
Piston set	¾" to 1½"	**2**, **3**, **7**, **12**
	DN50 to DN100	**2**, **3**, **5**, **6**, **7**, **12**, **15**
Set of cover studs and nuts		**13**

How to order spares
Always order spares by using the description given in the column headed 'Available spares' and state the size and type of valve.

Example:
1 off piston set for a DN50 Spirax Sarco TW 3-port valve.

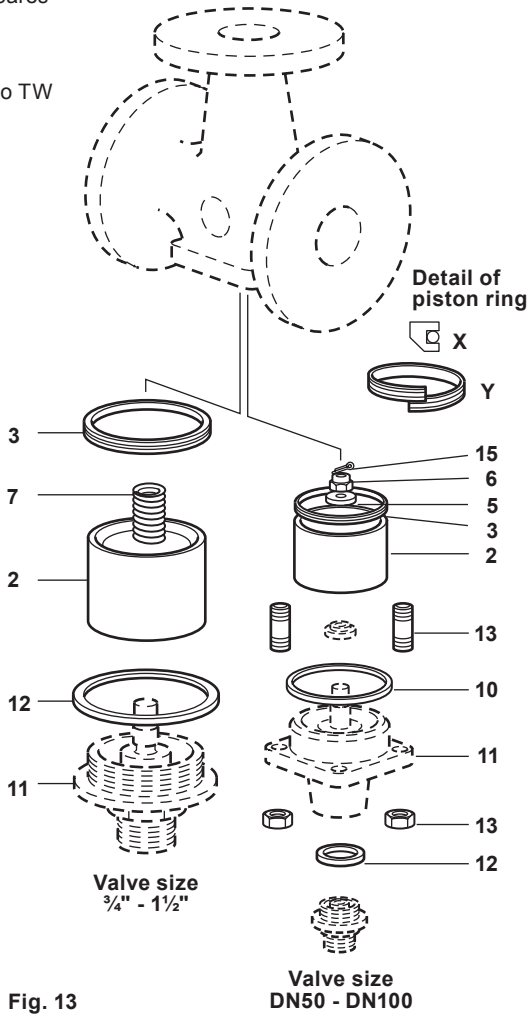


Fig. 13