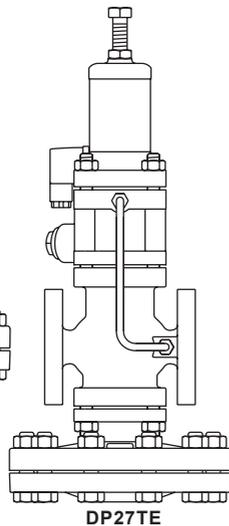
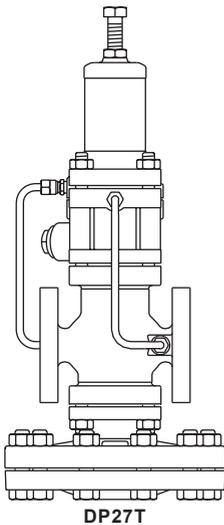


# DP27T and DP27TE Pilot Operated Pressure/Temperature Control Valves

## Installation and Maintenance Instructions

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1. Safety information
2. General product information
3. Installation
4. Commissioning
5. Operation
6. Maintenance
7. Fault finding



# 1. Safety information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by suitably 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 Pressure Equipment Directive (PED) and carry the

 mark when so required.

The products fall within the following Pressure Equipment Directive categories:

	Product	Group 2 Gases
DP27T and DP27TE	DN15 - DN40	SEP
	DN50	1

- i) The products have been specifically designed for use on steam, air and inert industrial gases 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 and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

## 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 300 °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**

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.

#### **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.

## 2. General product information

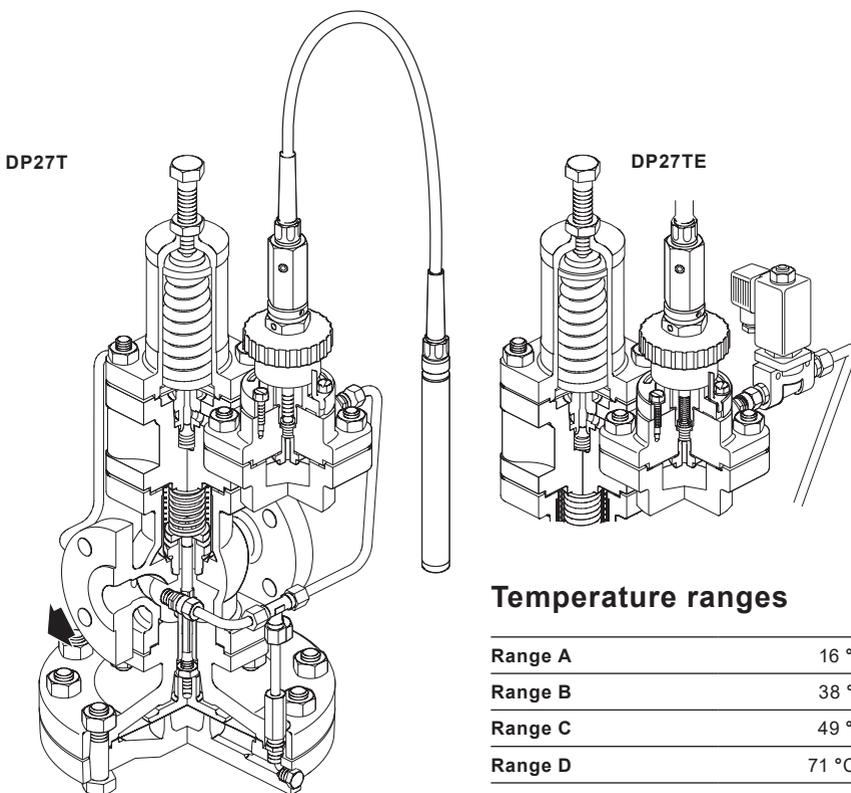
### 2.1 General description

The DP27T and DP27TE are combined pressure/temperature control valves for use on steam applications. They are designed to be used in conjunction with a 2 m length of capillary which is available separately (other lengths available on request). They combine a temperature and pressure pilot valve in one unit. This controls the main valve so that the temperature is maintained while the maximum steam pressure is limited. A variable rate conical pressure adjustment spring is fitted providing a downstream pressure range of 0.2 - 17 bar g.

- Notes:**
1. The sensor of the control system will need to be mounted by either a union kit, pocket or wall mounting bracket.
  2. For additional information see the relevant Technical Information Sheet.

#### Available types of valve:

<b>DP27T</b>	Pressure/temperature control
<b>DP27TE</b>	Pressure/temperature control with electrically operated solenoid valve



#### Temperature ranges

<b>Range A</b>	16 °C to 49 °C
<b>Range B</b>	38 °C to 71 °C
<b>Range C</b>	49 °C to 82 °C
<b>Range D</b>	71 °C to 104 °C
<b>Range E</b>	93 °C to 127 °C

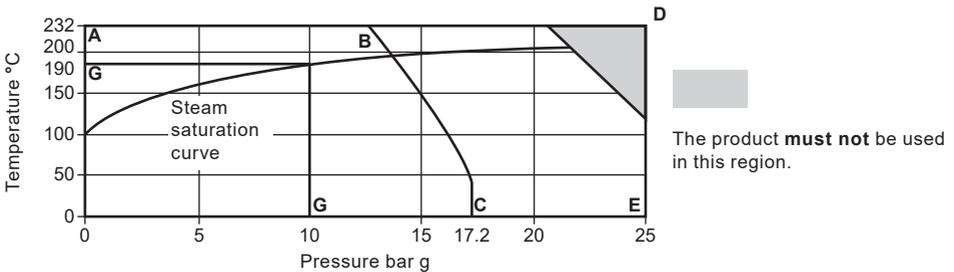
## 2.2 Sizes and pipe connections

Screwed BSP (BS 21 parallel) or NPT (1/2" to 1" only).

Flanged DN15LC - Low Capacity version, DN15, DN20, DN25, DN32, DN40 and DN50.

Standard	<b>DN15 - DN50</b> EN 1092 PN25	<b>Note:</b> For additional information see the relevant Technical Information Sheet.
	<b>DN25 - DN50</b> BS 10 Table H and ASME (ANSI) 300	
Flanges:	<b>DN15 - DN50</b> JIS 10, JIS 16 and ASME (ANSI) 150	
Available on request:	<b>DN15 - DN20</b> BS 10 Table F	
	<b>DN15</b> ASME (ANSI) 300	

## 2.3 Pressure/temperature limits



**A-D-E** Screwed and flanged EN 1092 PN25, ASME (ANSI 300), and BS 10 Table H.

**A-B-C** Flanged ASME (ANSI) 150.

**G-G** The DP27TE is limited to 10 bar g @ 190 °C.

Body design conditions	PN25	
Maximum design pressure	<b>A-D-E</b>	25 bar g @ 120 °C
	<b>A-B-C</b>	17.2 bar g @ 40 °C
Maximum design temperature	232 °C @ 21 bar g	
Minimum design temperature	-10 °C	
Maximum upstream pressure for saturated steam service	<b>DP27T</b>	17 bar g
	<b>DP27TE</b>	10 bar g
Maximum operating temperature	<b>DP27T</b>	232 °C @ 21 bar g
	<b>DP27TE</b>	190 °C @ 10 bar g
Minimum operating temperature	0 °C	
<b>Note:</b> For lower operating temperatures consult Spirax Sarco.		
Maximum differential pressure	<b>DP27T</b>	17 bar
	<b>DP27TE</b>	17 bar
Designed for a maximum cold hydraulic test pressure of:	38 bar g	
<b>Note:</b> With internals fitted, test pressure must not exceed:	25 bar g	

# 3. Installation

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

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

The installation instructions are dealt with under two headings, 'The valve' and 'The temperature control system'.

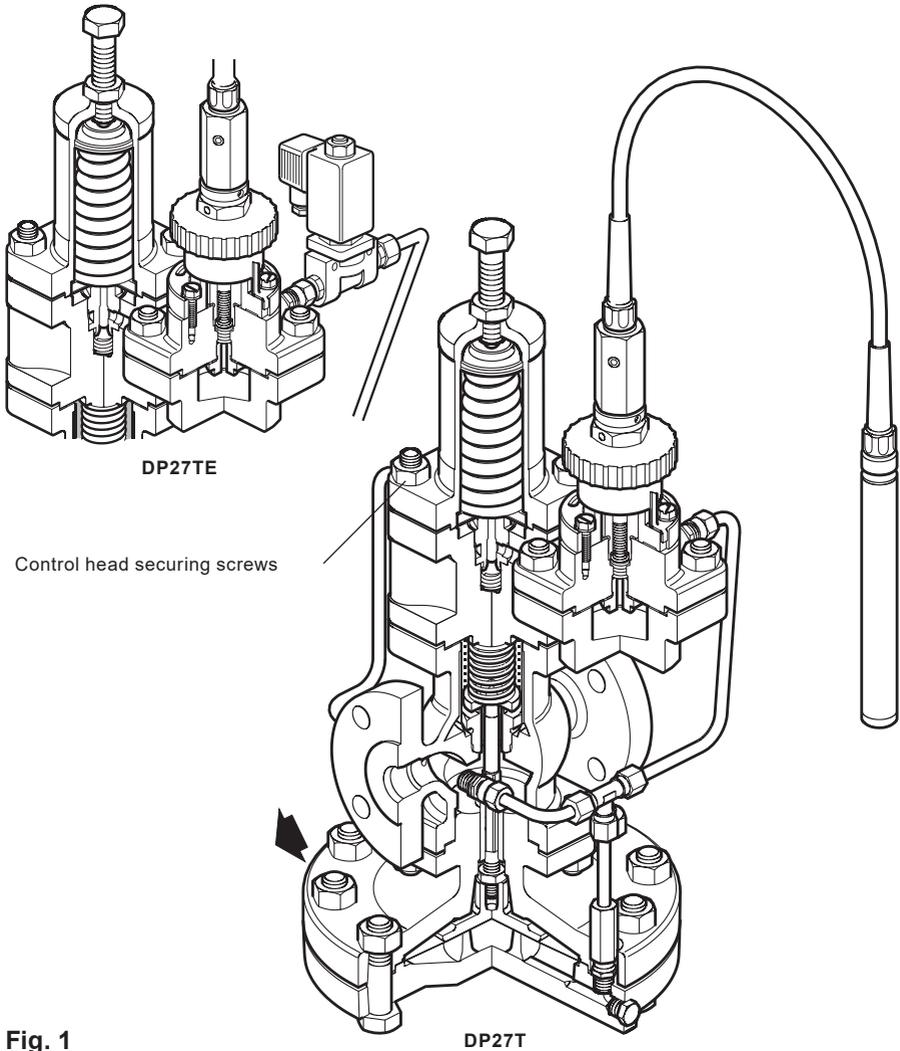


Fig. 1

## 3.1 Supply (Figure 1)

### DP27T

The DP27T pressure/temperature control is supplied with the temperature control unit packed separately and should be assembled securing the control head to the valve by means of the three screws supplied.

The valve is fitted with a control spring most suited to the downstream pressure condition quoted on the order, but will not be pre-set.

The temperature control unit is fitted with a control system having a range most suited to the temperature given on the order but it is not pre-set.

### DP27TE

The DP27TE pressure/temperature control is supplied as for the DP27T but a solenoid operated valve is fitted in the pipe between the pilot valve and the main diaphragm chamber, thus in series with the normal pilot valve.

The purpose of the solenoid valve is to override the pilot valve thus causing the main valve to shut-off. It can be controlled by any device capable of interrupting the supply of current to the solenoid coil such as a thermostat, pressure switch or time clock. A suitable time clock is available from Spirax Sarco.

The solenoid is arranged to open the valve when the coil is energised so that whatever switching device is used it must be arranged to break the current to close the main valve. In this way the unit will always 'fail-safe' i.e. will close the main valve in the event of a failure in electrical supply.

### Electrical supply

It is important that the solenoid is connected to the correct voltage. The standard unit is suitable for 230  $\pm 10\%$  Vac or 115  $\pm 10\%$  Vac 50 Hz supply, but units for other ac voltages may be supplied to special order, therefore always check on the supply details which are stamped on the solenoid valve name-plate before attempting to connect up.

Electrical connection is by cable plug to DIN 43650. Remember that the valve is on a steam supply line and in use will get hot. All wiring, connectors, etc. in close proximity to the valve should therefore be of heat resisting type.

### Earth

The solenoid valve should be adequately earthed.

### 3.2 The valve

#### General arrangement

Figure 2 shows the recommended installation layout to ensure satisfactory operation of the DP27T pressure/temperature control. It should always be fitted in a horizontal pipeline with the main diaphragm chamber below the line.

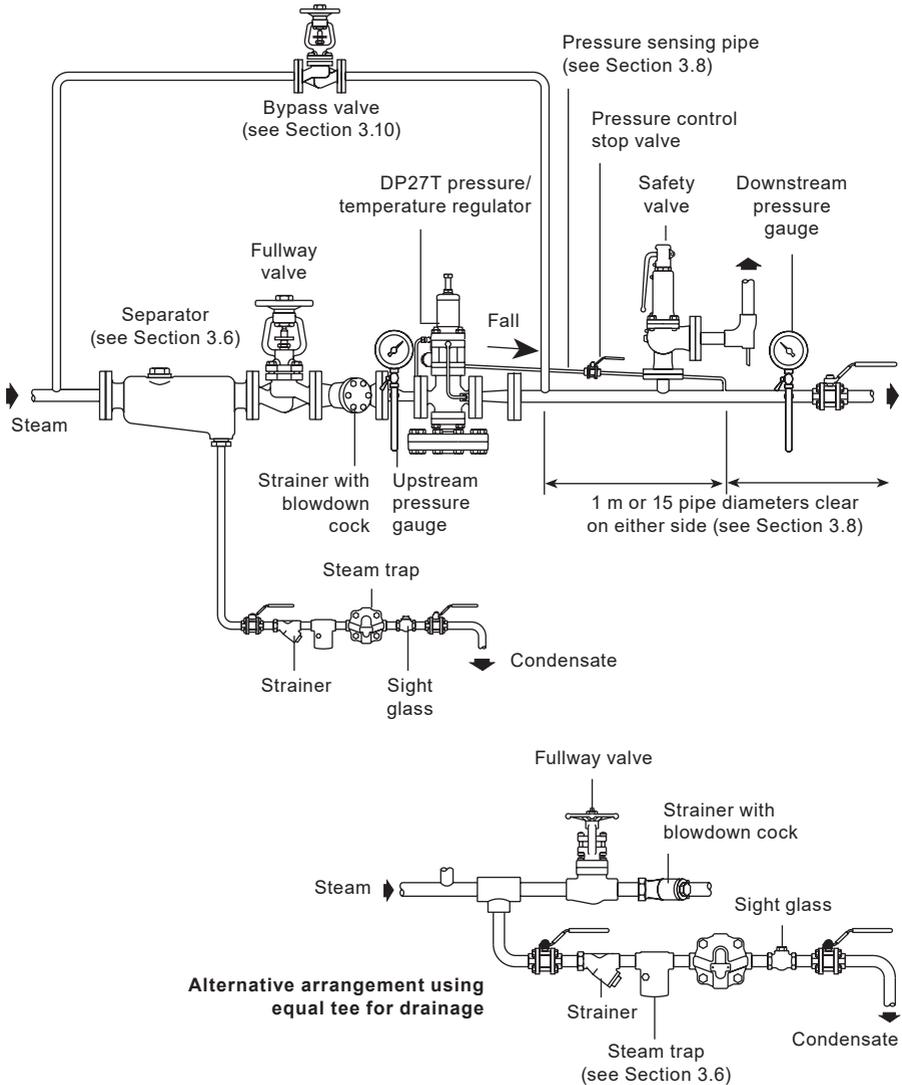


Fig. 2 Recommended installation

### 3.3 Pipeline sizing

The piping on both sides of the valve must be sized so that velocities do not exceed 30 m/s. This means that a properly sized valve will often be smaller than the connecting pipework.

### 3.4 Pipeline stresses

Line stresses such as could be caused by expansion or inadequate support should not be imposed on the valve body.

### 3.5 Isolating valves

These should preferably be of the fullway type.

### 3.6 Removal of condensate

Ensure that the pipework is adequately drained so that the valve is supplied with dry steam. The ideal arrangement is to fit a separator in the steam supply. If the steam is known to be dry then a drain pocket may be adequate.

If there is a rise in the low pressure line from the valve then a further drain point should be provided to keep the valve drained after shutdown.

### 3.7 Preventing dirt

The valve should be protected by a pipeline strainer with 100 mesh screen. The strainer should be fitted on its side to prevent the accumulation of water.

### 3.8 Pressure control pipe

The valve will be supplied complete with a balance pipe assembly connecting the side of the body with the side of the pilot valve chamber.

When close control of pressure and/or maximum capacity is required, an external pressure sensing pipe must be fitted.

To fit this alternative downstream sensing pipe, first remove the balance pipe assembly. The resulting 1/8" BSP tapping in the side of the body should be blanked using the plug provided in the linen bag attached to the valve (which also contains the fitting instructions and a spare pilot filter). The other 1/8" BSP fitting in the side of the pilot valve chamber is suitable for the fitting of 6 mm O/D pipe. If suitable pipe is not available the compression fitting can be removed and 1/4" nominal bore steel pipe screwed directly into the pilot valve chamber.

The downstream pressure sensing pipe (not supplied) should be connected into the top of the reduced pressure main at a point where in either direction there is a length of straight pipe uninterrupted by fittings for at least 1 m or 15 pipe diameters whichever is the greater. It should be arranged with a positive fall so that any condensate can drain away from the DP27T. Where the size of the reduced pressure main makes it difficult to maintain a fall when entering the top of the main, the pressure control pipe may be connected in the side of the main. A stop valve should be fitted for isolating purposes.

### 3.9 Pressure gauges

It is essential to fit a pressure gauge on the downstream side so that the valve can be properly set. A pressure gauge on the upstream side can also be useful.

### 3.10 Bypass

If it is essential to maintain a constant supply of steam and the reducing valve station does not include duplication or stand-by equipment, it may be necessary to install a bypass to ensure continuation of supply when the reducing valve is being serviced (see Figure 2).

The bypass valve will normally be the same size as the reducing valve. The handwheel should be padlocked to prevent use by unauthorised personnel, and when in use should be under constant manual supervision. The bypass may be arranged above or to the side of the main assembly but never below it.

### 3.11 Safety valve

A safety valve should be fitted to protect the downstream equipment from excessive pressure. It should be set to lift below the safe working pressure of the downstream equipment, and will normally be sized to pass the full capacity of the PRV should the PRV fail in the fully open position. The safety valve set pressure should take account of its reseal characteristic and the 'No-load' pressure setting of the PRV. For example, the typical blowdown value (reseal differential) for a DIN type safety valve is 10% of set pressure. The minimum possible safety valve set pressure must therefore equal the no-load set pressure of the reducing valve plus the blowdown value of the safety valve plus a small margin of at least 0.1 bar. If the set pressure is any lower, if whatever reason the safety valve lifts it will not shut properly and will simmer, creating a leak which is often wrongly diagnosed as a result of a leaking reducing valve. Discharge pipework should be taken to a safe place.

### 3.12 Position in relation to other control valves

Line or system isolation valves (**A**), either remotely actuated or manual, should be installed on the upstream side of the DP reducing valve.

Where there is downstream control equipment (**B**), particularly when it is fast acting (for instance pulsed piston actuated valves) ensure the control equipment is at least 50 pipe diameters away from the DP to prevent pressure pulses being transmitted back causing unstable operation and premature wear or if this is impractical an intermediate vessel can provide a similar benefit.

Where a safety valve (**C**) is required to protect the system downstream of a DP and where a control valve is also being used downstream of the DP, it is recommended that the safety valve is fitted downstream of the control valve rather than in between the DP and the control valve. If any slight leakage occurs this will avoid any pressure build-up causing nuisance operation of the safety valve but provide complete protection for the downstream system.

Where valves are installed downstream of the DP (**B**) the intermediate downstream pipework must be properly trapped (**D**) to ensure no condensate can build up on the downstream side of the DP.

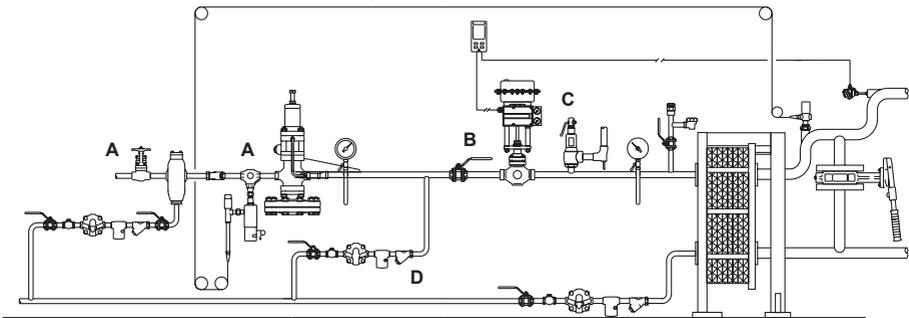


Fig. 3 DP position in relation to other control equipment

### 3.13 Temperature ranges

The temperature control system is available in five temperature ranges as follows:-

Range A	16 °C to 49 °C
Range B	38 °C to 71 °C
Range C	49 °C to 82 °C
Range D	71 °C to 104°C
Range E	93 °C to 127 °C

### 3.14 Sensor bulb

The type DP27T control is fitted with a plain bulb as in Figure 4, but as an optional extra this bulb is supplied with an adaptor shown in Figure 5, consisting of a union nipple (U), 'O' ring (V) and gland nut (W).

### 3.15 Use of plain bulb

Where it is desired to use a plain bulb as in Figure 4 the adaptor can be removed by unscrewing the gland nut (W) from the union nipple (U) and withdrawing each piece of the assembly separately over the bulb.

### 3.16 Use of immersion bulb

Where it is desired, insert the bulb into a vessel under pressure. Unscrew the gland nut (W) from the union nipple (U). This will enable the union nipple to withdraw over the bulb. The union nipple can now be screwed into the tapping provided at the temperature sensing point.

The union nipple is normally threaded 3/4" BSP but may be 3/4" NPT if specially ordered.

Insert the bulb through the union nipple (U) until the 'O' ring (V) seats in the union nipple as shown in Figure 5 and screw home the gland nut (W) to compress the 'O' ring. **The gland nut needs to be little more than finger tight. Do not overtighten otherwise damage to the 'O' ring will result.**

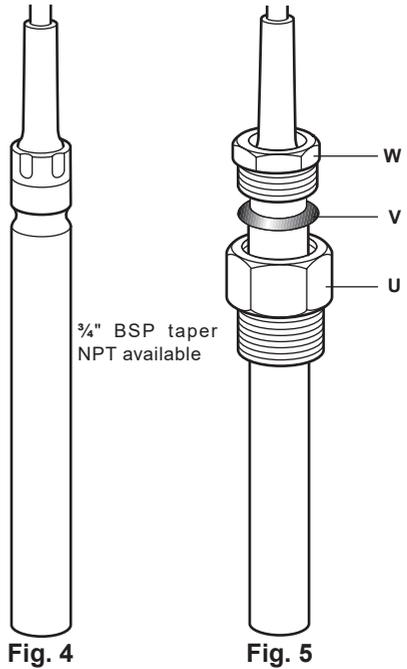


Fig. 4

Fig. 5

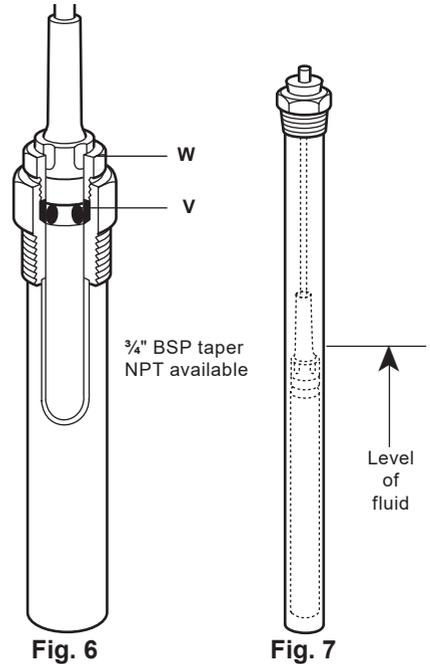


Fig. 6

Fig. 7

### 3.17 Pockets

In all cases where the temperature sensing point is in a fluid under pressure it is best to use a pocket so that the bulb can be withdrawn for servicing without draining down the plant.

Pockets must also be used where the medium being controlled would attack and destroy the material from which the bulb is constructed.

The top of the pocket is formed exactly as the union nipple and should be screwed into the tapping ( $\frac{3}{4}$ " BSP or  $\frac{3}{4}$ " NPT) provided at the temperature sensing point.

Insert the bulb into the pocket until the 'O' ring seats in the union nipple as Figure 6, and screw home the gland nut (W) to compress the 'O' ring.

**The gland nut (W) will be little more than finger tight. Do not overtighten otherwise damage to the 'O' ring will result.**

### 3.18 Extra long pockets

Where extra long pockets are used the plain bulb should be used and inserted the full length of the pocket. A split bung is provided to seal the top of the pocket Figure 7.

### 3.19 Heat conduction

Where a bulb is used in a pocket the pocket should be filled with a heat conducting fluid, such as thin oil or water, to improve heat transfer.

Do not fill the extended pocket Figure 7, above the level of the bulb.

### 3.20 Wall mounting sensor

Where the type DP27T control is to be used to control from room temperature the plain bulb Figure 4 is used and a bracket and protective shield is provided Figure 8.

It is essential that the sensor be fitted in such a position that it can sense the true room temperature and is not influenced by draughts.

It is preferably fitted in the vertical position and can be fitted either with the capillary leading from the top of the sensor or leading from the bottom.

Having decided on the sensor position fix the bracket to the wall making sure that it is fitted in such a way that the lug standing proud of the base will engage with the groove turned in the sensor.

After inserting the sensor in the clips, fit the external cover as in Figure 9.

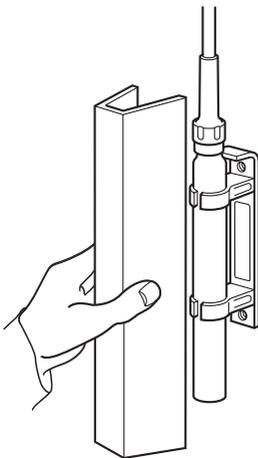


Fig. 8

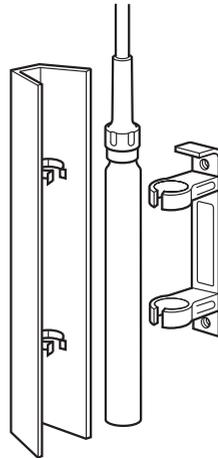


Fig. 9

# 4. Commissioning

## Warning Direct injection systems

**This product contains a rust inhibitor to protect it against corrosion during storage. To avoid any possible contamination of your product, after first blowing down the approach pipework, we recommend that the valve is blown through thoroughly in order to remove any trace of the inhibitor.**

When the pressure/temperature control is installed and all connections are properly made it must be brought into operation in two stages

- a) Pressure reduction.
- b) Temperature control.

## 4.1 To set the reduced pressure

1. Ensure that all connections are properly made and that all valves are closed.
2. Check that adjustment is turned fully anticlockwise until the spring is slack.
3. Open small valve in pressure control line.
4. Blow through the approach pipework by removing the cap and screen from the strainer protecting the steam trap draining the upstream pipework. Do not remove the screen from the main line strainer during this operation. Although this should remove most of the dirt which is present, it may be necessary to examine and clean the main line strainer at regular intervals.
5. Slowly open the upstream isolating valve until it is fully open.
6. Slowly open the downstream valve until it is fully open.
7. Using a 19 mm A/F spanner slowly turn adjustment screw in a clockwise direction until desired pressure reading is obtained.
8. Holding the adjustment screw in position, with the spanner, tighten down the lock-nut to secure the setting of the adjustment spring, making sure that the 'C' washer stays in position.

## 4.2 To set the temperature

1. Check that the temperature scale can be easily seen. If it is fitted in a confined space facing a wall for example the control head may be repositioned to enable the scale to be more easily read as follows:-  
Undo the three screws. The control head may now be turned through 120° or 240° and the screws tightened up.
2. By turning the knurled knob, set the scale opposite the pointer to the temperature at which it is desired to control. (Where it is essential that this temperature be not exceeded it is advisable to set the control initially some 6 °C lower and bring the plant up to temperature slowly).
3. Put the plant in operation in the normal way allow 30 minutes for it to settle down, then check the temperature against a reliable thermometer - this check reading should be taken as close to the control point as possible to ensure that both the thermometer and the sensor bulb are sensing similar conditions.
4. Compare the thermometer reading with scale reading on the temperature control.
5. This may be found to differ by a few degrees and if precise control is required can be adjusted by resetting the pointer as follows:
6. Holding the control head tightly onto the pilot valve housing - slacken the three screws, just sufficiently to enable the pointer to be moved to the right or left until the temperature indicated on the scale corresponds with the actual temperature as shown on the sensor. Whilst making this adjustment it is essential to hold the control head tightly onto the pilot valve housing otherwise not only will movement of the pointer be difficult but allowing the head to lift will open the pilot valve.
7. Tighten the three screws.
8. The adjustment knob may now be reset to the required temperature. Adjustments to raise or lower the temperature may be freely made without damage to the control system.

# 5. Maintenance

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

**Warning:**

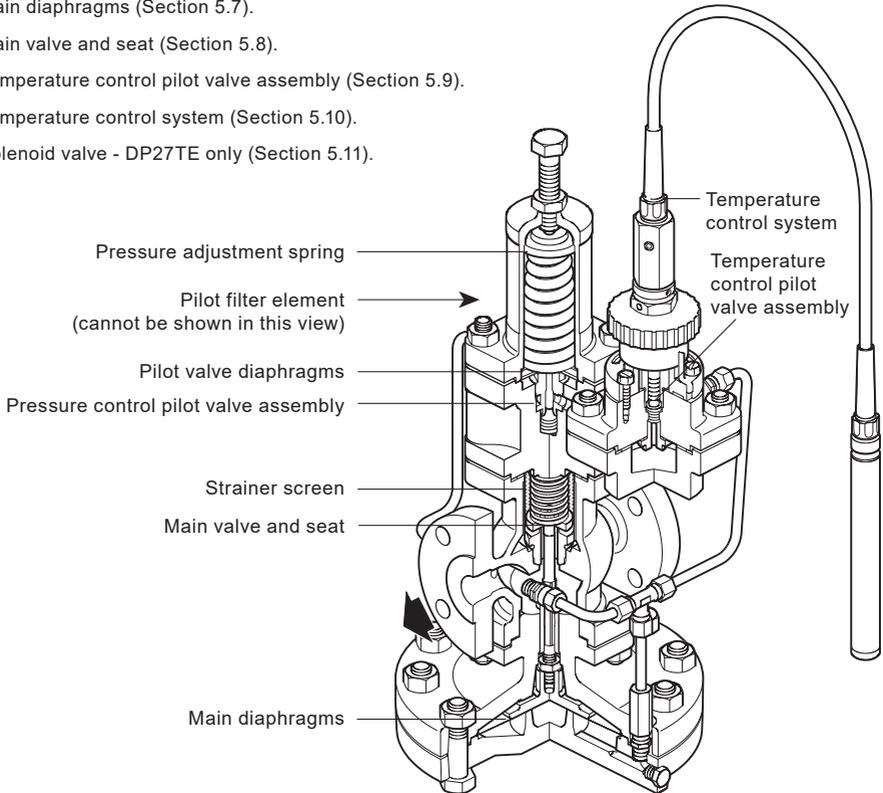
The body gasket contains a thin stainless steel support ring which may cause physical injury if not handled and disposed of correctly.

## 5.1 Routine maintenance

It is recommended that the valve is dismantled once every twelve to eighteen months for a complete overhaul and ideally this should be carried out with the valve removed from the line.

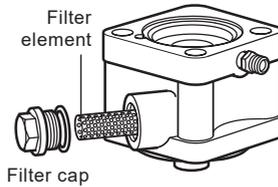
The parts that may require replacing or refurbishing are listed below:

- Pilot filter element (Section 5.2).
- Pressure adjustment spring (Section 5.3).
- Pressure control pilot valve assembly (Section 5.4).
- Strainer screen (Section 5.5).
- Pilot valve diaphragms (Section 5.6).
- Main diaphragms (Section 5.7).
- Main valve and seat (Section 5.8).
- Temperature control pilot valve assembly (Section 5.9).
- Temperature control system (Section 5.10).
- Solenoid valve - DP27TE only (Section 5.11).



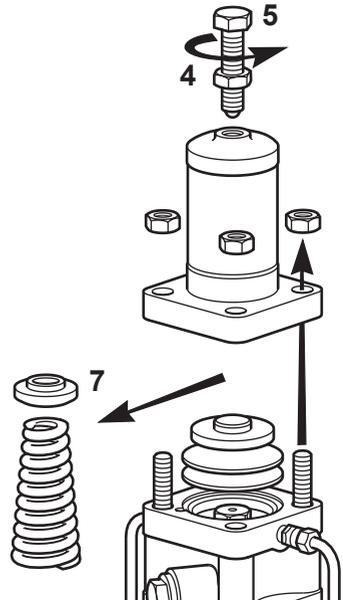
## 5.2 How to renew the pilot filter element:

1. Isolate reducing valve and zero the pressure.
2. Unscrew the filter cap and carefully withdraw the filter element.
3. Replace the element and tighten the filter cap to 90 - 100 N m.  
**Note:** The gasket is re-usable.



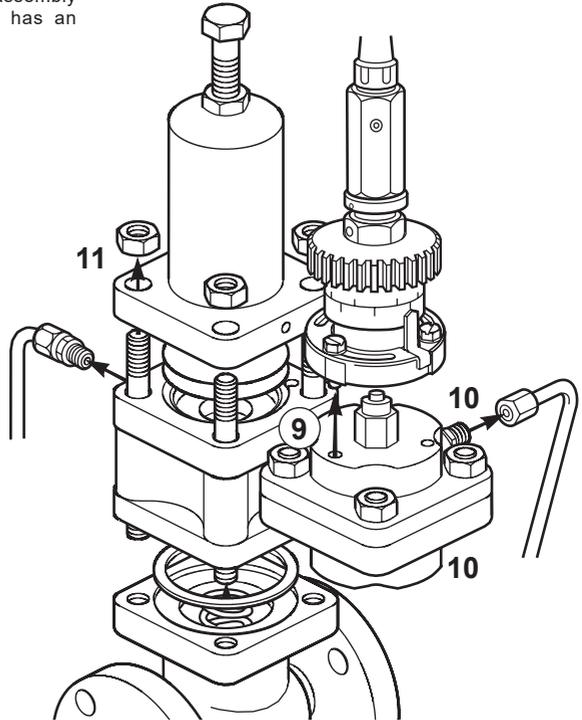
## 5.3 How to renew or change the pressure adjustment spring:

4. Isolate the reducing valve, zero the pressure and release the adjustment lock-nut.
5. Turn the adjustment screw anticlockwise. Ensure there is no compression on the pressure adjustment spring.
6. Undo the 4 off spring housing securing nuts and remove the spring housing.
7. Remove the pressure adjustment spring and the top spring plate.
8. Reassemble in reverse order.



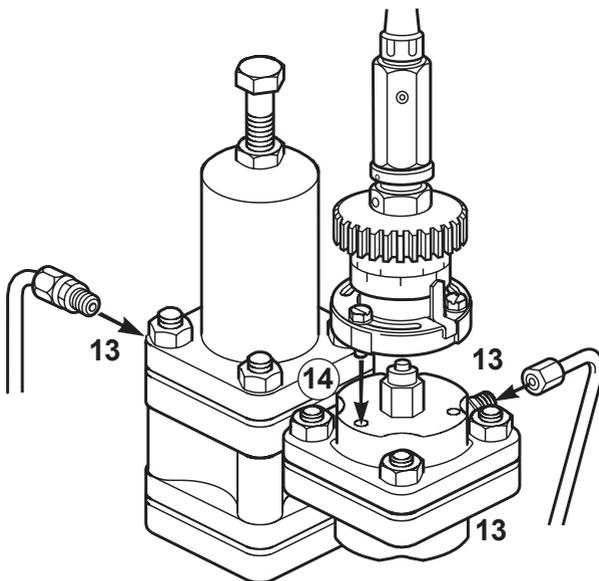
## 5.4 How to renew the pressure control pilot valve assembly:

- Isolate the valve and zero the pressure.
  - Remove sensor bulb and allow it to cool down otherwise the control system may be strained.
  - Follow Steps 1 to 5 then proceed as follows:
9. Undo the three screws and remove the temperature control head.
  10. Unscrew the unions and release the pipework and temperature control pilot assembly.
  11. Unscrew the nuts and remove the spring housing, bottom spring plate and diaphragms.
  12. Unscrew and remove the pilot valve assembly (19 mm A /F). The pilot assembly has an integral PTFE seal.



**Table 1**  
**Recommended tightening torques for spring housing/actuating chamber cover securing studs and nuts**

Size of valve	Nut size	Tightening torques
1/2", 3/4" and 1" DN15, DN20, DN25 and DN32	M10	40 - 50 N m
DN40 and DN50	M12	45 - 55 N m



13. Refit the pipework and temperature control pilot assembly, then retighten the unions to ensure a steam tight seal.

14. Refit the temperature control head. Complete assembly by following Steps 1 to 5 in reverse order.

Bring the valve back into commission by following as many Steps as necessary in Section 4.

The following handling precautions should be observed.

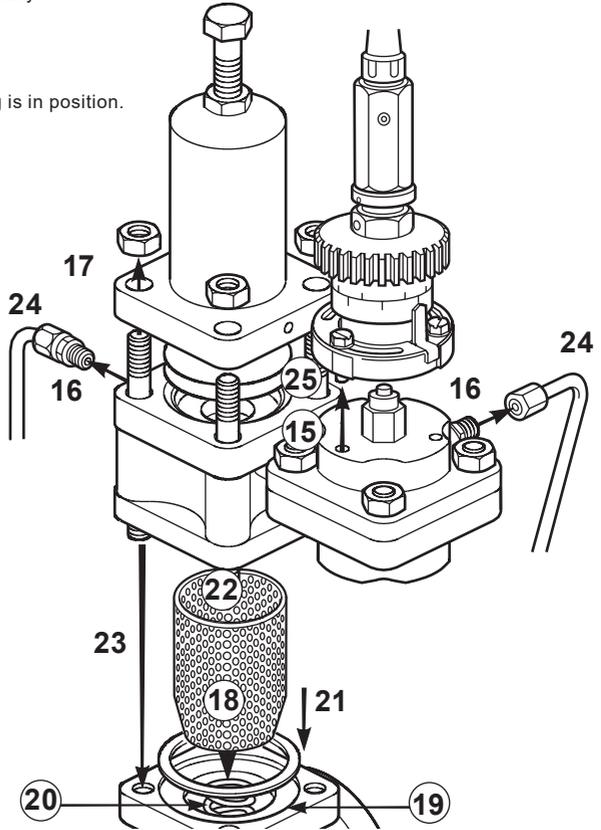
### Handling precautions for PTFE

Within its working temperature range PTFE is a completely inert material, but when heated to its sintering temperature it gives rise to gaseous decomposition products or fumes which can produce unpleasant effects if inhaled. Fumes can be produced during processing: for example, when the material is heated to sinter it, or when brazed connections are being made to cable insulated PTFE. The inhalation of these fumes is easily prevented by applying local exhaust ventilation to atmosphere as near to their source as possible.

Smoking should be prohibited in workshops where PTFE is handled because tobacco contaminated with PTFE will during burning give rise to polymer fumes. It is therefore important to avoid contamination of clothing, especially the pockets, with PTFE and to maintain a reasonable standard of personal cleanliness by washing hands and removing any PTFE particles lodged under the fingernails.

## 5.5 How to clean the strainer screen:

- Isolate the valve and zero the pressure. Remove the sensor bulb and allow it to cool down, otherwise the control system may be strained. Follow Steps 1 to 5 then proceed as follows:
15. Undo the three screws and remove the temperature control head.
  16. Unscrew the unions and release the pipework.
  17. Unscrew the nuts and remove the pilot valve housings complete with spring housing assembly.
  18. Remove the screen and clean.
  19. Ensure gasket faces are clean.
  20. Check that main valve return spring is in position.



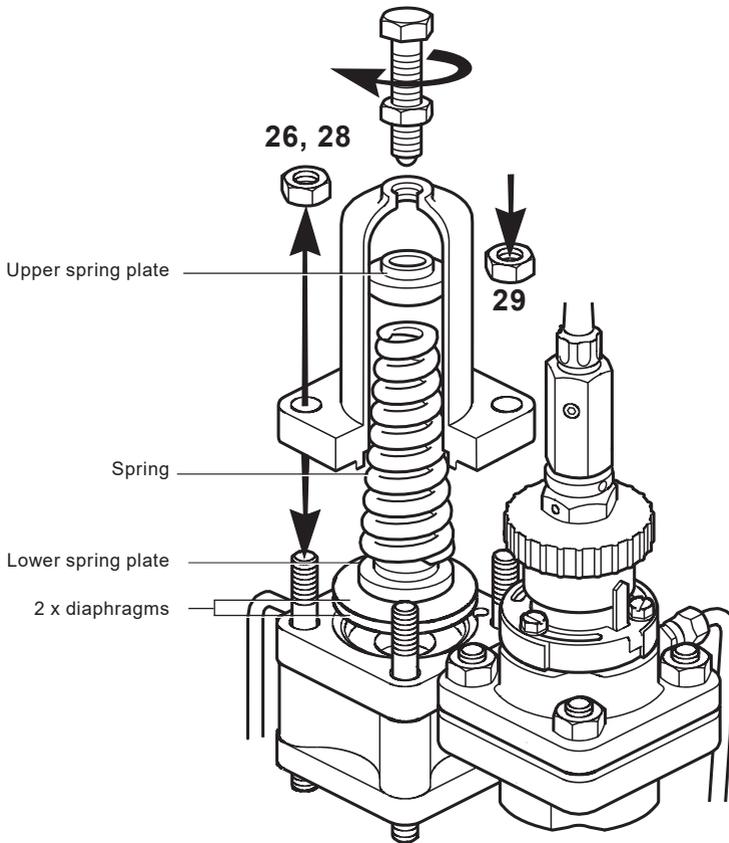
21. Fit a new gasket.
22. Replace the screen.
23. Assemble the pilot valve housings complete with the spring housing assembly and tighten the nuts to the recommended torques shown in Table 1, page 18.
24. Refit the pipework and retighten the unions to ensure a tight seal.
25. Refit the temperature control head.

Bring the valve back into commission by following as many Steps as necessary in Section 4.

## 5.6 How to renew pilot valve diaphragms:

- Isolate the reducing valve and zero the pressure. Remove sensor bulb and allow it to cool down, otherwise the control system may be strained. Follow Steps 1 to 5 then proceed as follows:
- 26. Unscrew the nuts and remove the spring housing, spring and upper and lower spring plate and old diaphragms.
- 27. Ensure that all contact faces are cleaned. New diaphragms should be fitted such that the precoated sealant (which is only applied to one diaphragm) faces down contacting the sealing face of the diaphragm chamber.
- 28. Replace lower spring plate, spring and upper spring plate.
- 29. Pressure Equipment Directive Assemble spring housing and tighten nuts to the recommended torques shown in Table 1. Complete assembly by following Steps 1 to 5 in reverse order.

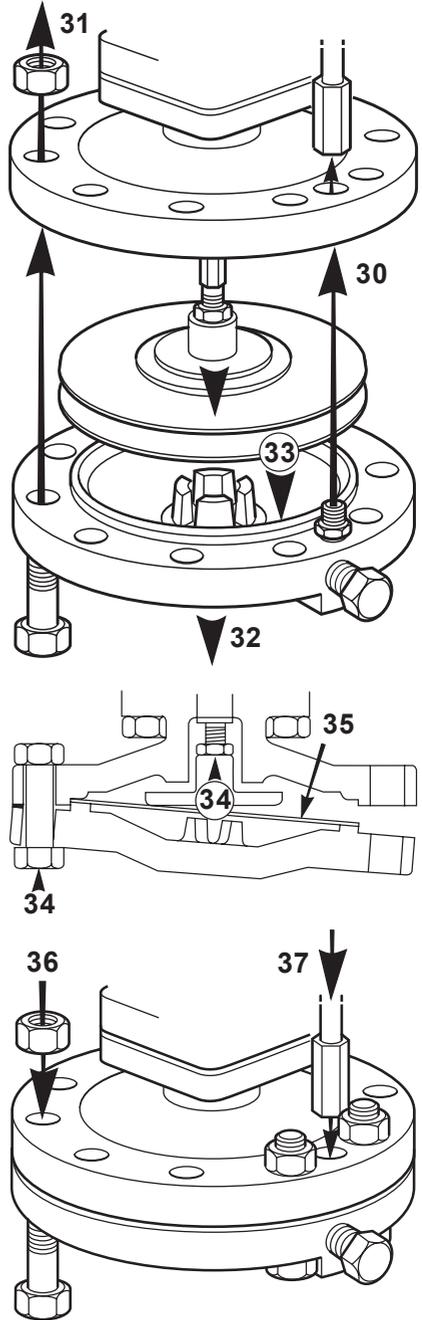
Bring the valve back into commission by following as many Steps as necessary in Section 4.



## 5.7 How to renew or clean main diaphragms:

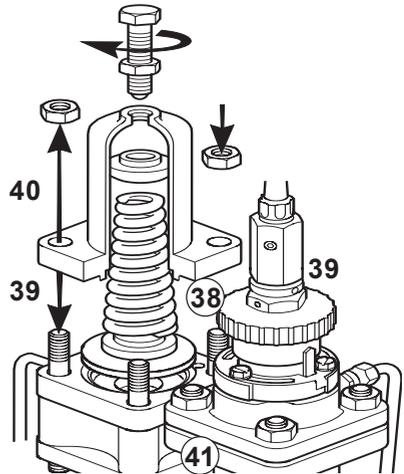
- Isolate the valve and zero the pressure. Remove the sensor bulb and allow it to cool, otherwise the control system may be strained.
30. Undo the long union nut and pull away.
  31. Undo the M12 nuts and bolts.
  32. Drop away the lower diaphragm chamber, the two diaphragms, diaphragm plate and pushrod assembly.
  33. Thoroughly clean the lower diaphragm chamber making sure that the contact faces are clean.
  34. Replace the diaphragm plate and pushrod assembly and loosely fit the lower diaphragm chamber on two bolts either side of the union connection to locate the the spigot in the recess.
  35. Bring the two new diaphragms together (where precoated sealant is applied this should face outwards) and slide into position. If the diaphragms are not renewed, but cleaned only care must be taken not to turn diaphragms over.
  36. Push the lower diaphragm chamber home to locate in recess and refit the M12 nuts and bolts. Progressively and evenly tighten to a torque of 75 N m.
  37. Retighten the long union nut to ensure a steam tight seal.

Bring the valve back into commission by following as many Steps as necessary in Section 4.



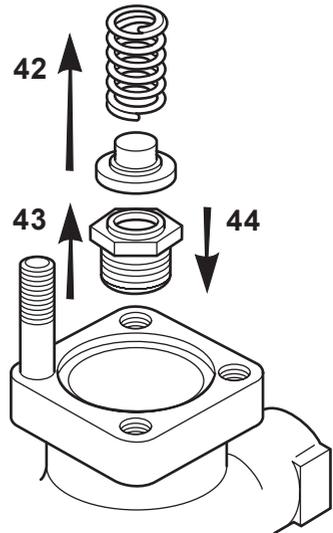
## 5.8 How to service or renew the main valve and seat:

- Isolate the valve and zero the pressure. Remove the sensor bulb and allow it to cool down, otherwise the control system may be strained. Follow Steps 1 to 5 then proceed as follows:
38. Undo the three screws and remove the temperature control head.
  39. Unscrew the unions and release the pipework.
  40. Unscrew the nuts and remove the pilot valve housings complete with the spring housing assembly.
  41. Remove the screen and clean.
  42. Remove the main valve spring and main valve head.
  43. Remove the main valve seat (see Table 2). Examine the faces of the main valve head and seat. If they are only slightly worn both the main valve head and main seat may be lapped on a flat plate using a fine grinding paste. If either is badly worn or unfit for further use they will need to be replaced.
  44. Refit the valve seat and tighten to the recommended torques shown in Table 2. Where a new part has been fitted it will be necessary to reset the main valve pushrod to give the correct valve lift. To do this it is necessary to expose the main diaphragm plate and pushrod assembly.



**Table 2**  
**Recommended tightening torques for main seat**

Size of valve	Width across flats	Tightening torques
½" and ½"LC	30 mm A/F (External)	110 - 120 N m
DN15 and DN15LC	30 mm A/F (External)	110 - 120 N m
¾" and DN20	36 mm A/F (External)	140 - 150 N m
1" and DN25	19 mm A/F (Inside)	230 - 250 N m
DN32	24 mm A/F (Inside)	300 - 330 N m
DN40	30 mm A/F (Inside)	450 - 490 N m
DN50	41 mm A/F (Inside)	620 - 680 N m

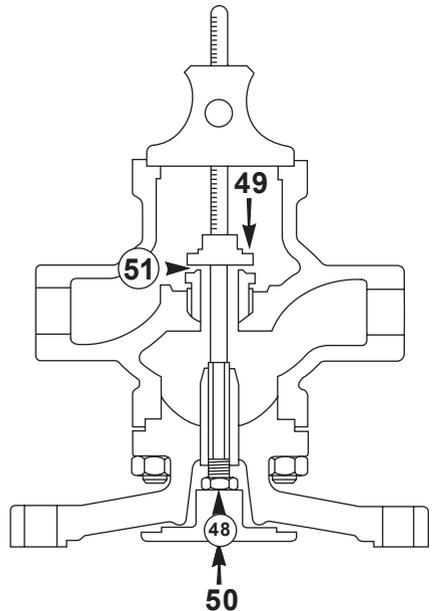
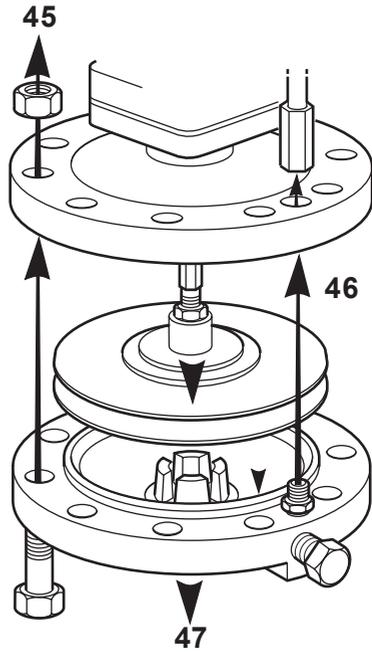


45. Undo the long nut and pull away.
46. Undo the M12 nuts and bolts.
47. Drop away the lower diaphragm chamber, the two diaphragms, diaphragm plate and pushrod assembly.
48. Refit the pushrod assembly.
49. Refit the main valve head making sure the valve locates on the seat.
50. Open the valve by pushing onto the diaphragm plate, until it comes up against the stop on the body.
51. Check the valve lift using a depth gauge (see Table 3).

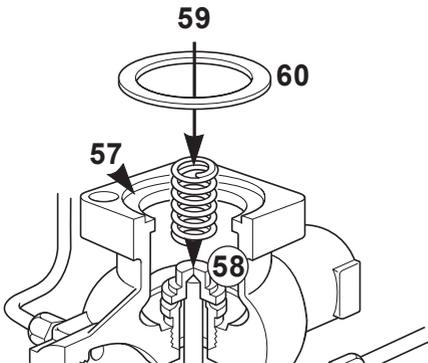
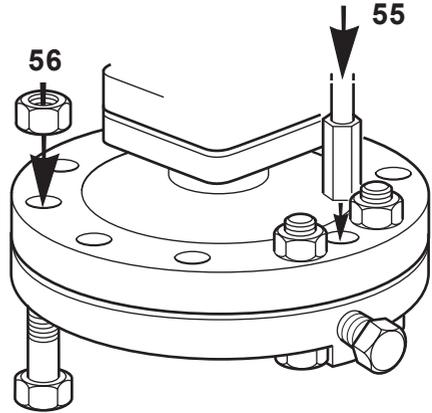
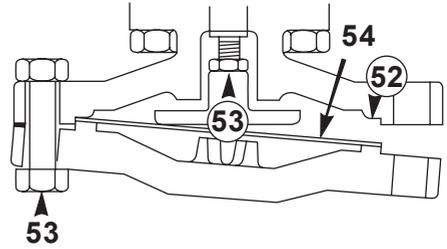
**Table 3 Valve lift**

Size of valve	Valve lift
DN15 LC and ½" LC	2.5 mm
DN15 and ½"	2.5 mm
DN20 and ¾"	2.5 mm
DN25 and 1"	3.0 mm
DN32	3.5 mm
DN40	4.5 mm
DN50	5.0 mm

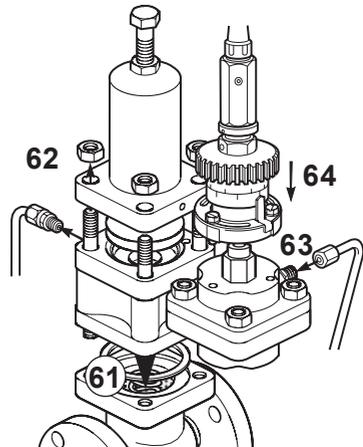
Adjust if necessary by screwing the pushrod in or out of the diaphragm plate.



- 52. Thoroughly clean the upper and lower diaphragm chamber making sure that the contact faces are clean.
- 53. Replace the diaphragm plate and pushrod assembly and loosely fit the lower diaphragm chamber on the two bolts either side of the union connection to locate the spigot in the recess.
- 54. Refit diaphragms in exactly the same way as when dismantled.
- 55. Push the lower diaphragm chamber home to locate in the recess and refit the M12 nuts and bolts. Progressively and evenly tighten to a torque of 75 N m.
- 56. Retighten the long union nut to ensure a steam tight seal.
- 57. Ensure gasket faces are clean.



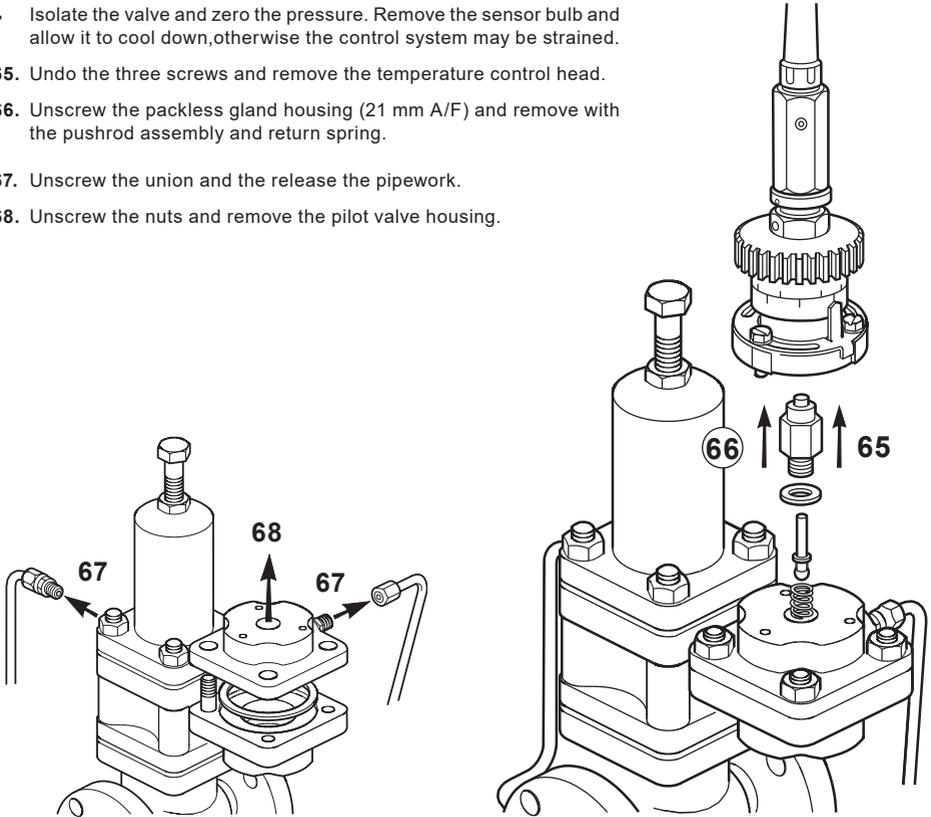
- 58. Refit the main valve head.
- 59. Replace the main valve return spring.
- 60. Fit new gasket.
- 61. Replace the screen.
- 62. Assemble the pilot valve housings complete with the spring housing assembly and tighten the nuts to the recommended torques shown in Table 1.
- 63. Refit the pipework and retighten the unions to ensure a tight seal.
- 64. Refit temperature control head.



Bring the valve back into commission by following as many Steps as necessary in Section 4.

## 5.9 How to renew the temperature control pilot valve assembly:

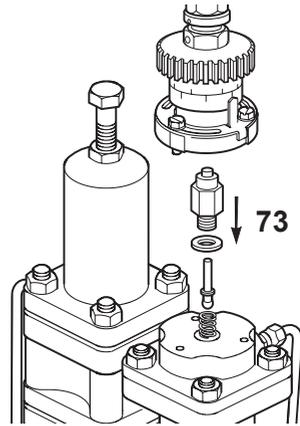
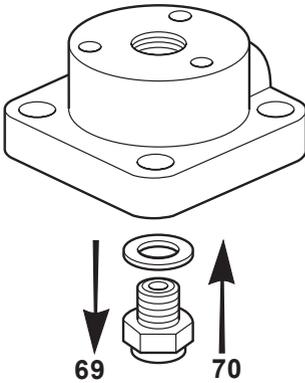
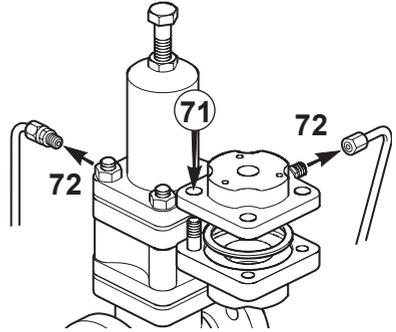
- Isolate the valve and zero the pressure. Remove the sensor bulb and allow it to cool down, otherwise the control system may be strained.
- 65. Undo the three screws and remove the temperature control head.
- 66. Unscrew the packless gland housing (21 mm A/F) and remove with the pushrod assembly and return spring.
- 67. Unscrew the union and the release the pipework.
- 68. Unscrew the nuts and remove the pilot valve housing.



- 69. Unscrew and remove the pilot valve seat (20 mm A/F).
- 70. Screw the new pilot valve seat into the housing.
- 71. Assemble the pilot valve housing and tighten the nuts to 40 N m.
- 72. Refit the pipework and retighten the unions to ensure a steam tight seal.
- 73. Fit the new pushrod assembly with the return spring and replace the packless gland housing, tighten to 40 N m.

Bring the valve back into commission by following as many Steps as necessary in Section 4.

After fitting a new pilot valve seat and pushrod it will be necessary to check the temperature control point (see Section 4.2, Step 2).



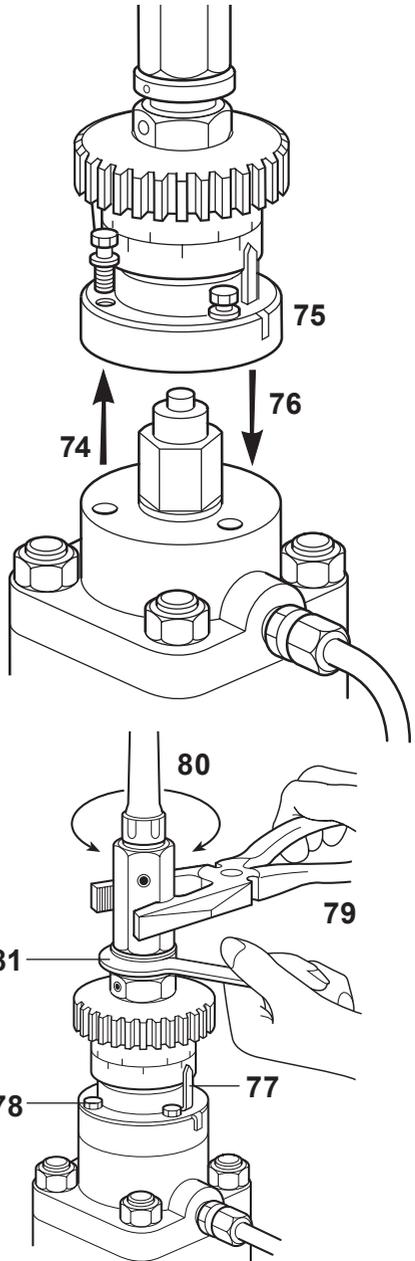
## 5.10 How to renew the temperature control system:

- Isolate the valve and zero the pressure. Withdraw the sensor bulb from the plant and allow it to cool.
74. Undo the three screws and lift off the control head.
  75. Fix the control head of replacement temperature control system in position. Take care that the limit stop of the pointer ring is properly located in the slot.
  76. Retighten the screws.

Bring the valve back into commission by following as many Steps as necessary in Section 4.

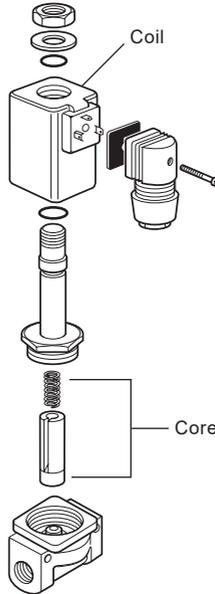
With a replacement thermostatic system it may be found that the pointer cannot be moved far enough to reach the desired reading on the scale when the medium around the bulb is at the correct temperature. If this is so, resetting of the calibration can be carried out using the special spanner supplied with each replacement sensor.

77. Fix the pointer in the mid-position of its adjustment and set the scale to indicate the required temperature.
78. Tighten up screws.
79. Hold the sleeve with a pair of pliers and loosen the locking ring using the special spanner.
80. Still holding the sleeve with pliers, turn clockwise if the temperature of the medium being controlled is too high or anticlockwise if the temperature is too low.
81. After re-setting, tighten up the locking ring with the special spanner.



## 5.11 How to service or renew the solenoid valve (DP27TE):

- Depressurize the valve and turn off the electrical power supply.
82. Remove the retaining clip and slip the entire solenoid enclosure off the solenoid base sub-assembly of the plug nut/core tube of the sub-assembly.
  83. Unscrew the bonnet of the solenoid base sub-assembly and remove the core spring, core assembly and body gasket.  
All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare parts kit (item 'W') for best results.
  84. Reassemble in reverse order of disassembly paying careful attention to exploded views provided.



### CAUTION

Solenoid must be fully reassembled as the housing is part of, and completes the magnetic circuit.

## 6. Spare parts

The spare parts available are shown in heavy outline. Parts drawn in broken line are not available as spares.  
**Please note:** A Table is shown on page 32 indicating interchangeability of spares.

### Available spares

Maintenance kit

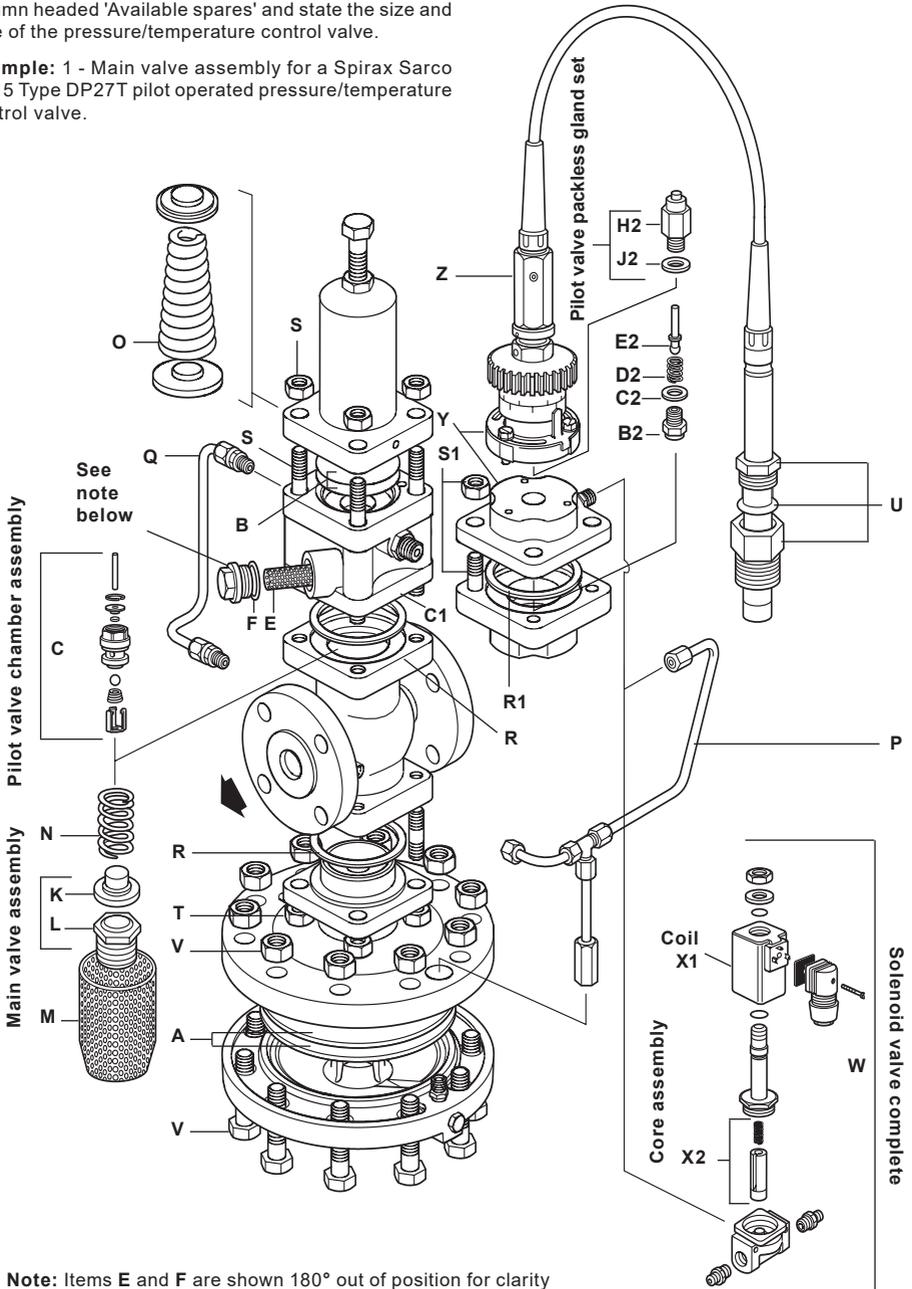
A stand-by set of spares for general maintenance purposes and covers all spares marked \*

Main diaphragm *		(2 off)	<b>A</b>
Pilot diaphragms *		(2 off)	<b>B</b>
Pilot valve assembly and filter			<b>C, C1</b>
Pilot valve filter and gasket		(packet of 3 of each)	<b>E, F</b>
Pilot valve assembly for temperature control unit			<b>B2, C2, D2, E2</b>
Pilot valve packless gland set *			<b>H2, J2</b>
Main valve assembly DN15 to DN50			<b>K, L</b>
Internal strainer *			<b>M</b>
Main valve return spring *			<b>N</b>
Pressure adjustment spring		0.2 - 17 bar	<b>O</b>
Control head (3 pieces) When ordering state range and length of capillary tube. Normally stocked in capillary lengths of 2 m. Available in multiples of 2 m up to a maximum of 14 m (at extra cost).	Range A	16 °C to 49 °C	<b>Y, Z</b>
	Range B	38 °C to 71 °C	
	Range C	49 °C to 82 °C	
	Range D	71 °C to 104 °C	
	Range E	93 °C to 127 °C	
Union sub assembly (3 pieces)			<b>U</b>
Control pipe assembly *			<b>P</b>
Balance pipe assembly			<b>Q</b>
Body gasket set *		(3 off)	<b>R</b>
Pilot valve block gasket and temperature control unit *		(3 pieces)	<b>R1</b>
Set of spring housing securing studs and nuts		(set of 4)	<b>S</b>
Set of main body studs and nuts		(set of 4)	<b>T</b>
Set of diaphragm securing bolts and nuts	Valve sizes	DN15 to DN32 (set of 10)	<b>V</b>
		DN40 to DN50 (set of 12)	
Set of temperature pilot valve housing securing studs and nuts		(set of 4)	<b>S1</b>
Set of adjustment head securing screws		(set of 3)	<b>Y</b>
<b>Type DP27TE only</b>	Solenoid valve complete		<b>W</b>
	Replacement coil		<b>X1</b>
	Valve seat and core assembly		<b>X2</b>

## 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 the pressure/temperature control valve.

**Example:** 1 - Main valve assembly for a Spirax Sarco DN15 Type DP27T pilot operated pressure/temperature control valve.



**Note:** Items E and F are shown 180° out of position for clarity

## Interchangeability of spares

The following table shows how in certain sizes some parts are interchangeable. For example in the line headed 'Main diaphragm' the diaphragm used in the screwed valves 1/2", 3/4" is common to these sizes by the letter 'a', the letter 'c' indicates that the one diaphragm is common to the DN32 and DN40 valve.

Spares which are marked '†' are interchangeable with the DP17 and DP27 pressure reducing valves.

Spares marked '★' are interchangeable with the 37D temperature control valve.

Spares marked '\*\*' are interchangeable with the DP27 temperature control valve.

		Screwed				Flanged						
		1/2"	1/2"	3/4"	1"	DN15	DN15	DN20	DN25	DN32	DN40	DN50
		LC				LC						
Maintenance kit		a	a	a	b	f	f	a	b	c	d	e
Main diaphragm	★ †	a	a	a	b	a	a	a	b	b	c	c
Pilot diaphragms	†	a	a	a	a	a	a	a	a	a	a	a
Pilot valve assembly for pressure control unit	**	a	a	a	a	a	a	a	a	a	a	a
Pilot filter and gasket	**	a	a	a	a	a	a	a	a	a	a	a
Pilot valve assembly for temperature control unit	★	a	a	a	a	a	a	a	a	a	a	a
Pilot valve packless gland set	★	a	a	a	a	a	a	a	a	a	a	a
Main valve assembly	★ †	a	b	c	d	a	b	c	d	e	f	g
Internal strainer	★ †	a	a	a	b	f	f	a	b	c	d	e
Main valve return spring	★ †	a	a	a	a	a	a	a	a	a	c	c
Pressure adjustment spring	†	a	a	a	a	a	a	a	a	a	a	a

		Screwed				Flanged						
		1/2"	1/2"	3/4"	1"	DN15	DN15	DN20	DN25	DN32	DN40	DN50
		LC				LC						
Control head	★	a	a	a	a	a	a	a	a	a	a	a
'O' ring for sensor bulb adaptor	★	a	a	a	a	a	a	a	a	a	a	a
Control pipe assembly		a	a	a	b	f	f	a	b	c	d	e
Balance pipe assembly	†	a	a	a	b	f	f	a	b	c	d	e
Gasket set	†	a	a	a	a	a	a	a	a	a	b	b
Pilot valve block gasket		a	a	a	a	a	a	a	a	a	a	a
Set of spring housing securing studs and nuts	†	a	a	a	a	a	a	a	a	a	b	b
Set of main body studs and nuts	★ †	a	a	a	a	a	a	a	a	a	b	b
Set of diaphragm securing bolts and nuts	★ †	a	a	a	a	a	a	a	a	a	b	b
Set of temperature pilot valve housing securing studs and nuts		a	a	a	a	a	a	a	a	a	a	a
Set of adjustment head securing screws	★	a	a	a	a	a	a	a	a	a	a	a

# 7. Fault finding

The DP27T pressure/temperature control system provides a combined unit for pressure reduction and temperature control.

It is important to remember that when approaching the set temperature, the temperature control pilot valve will override and lower the downstream pressure.

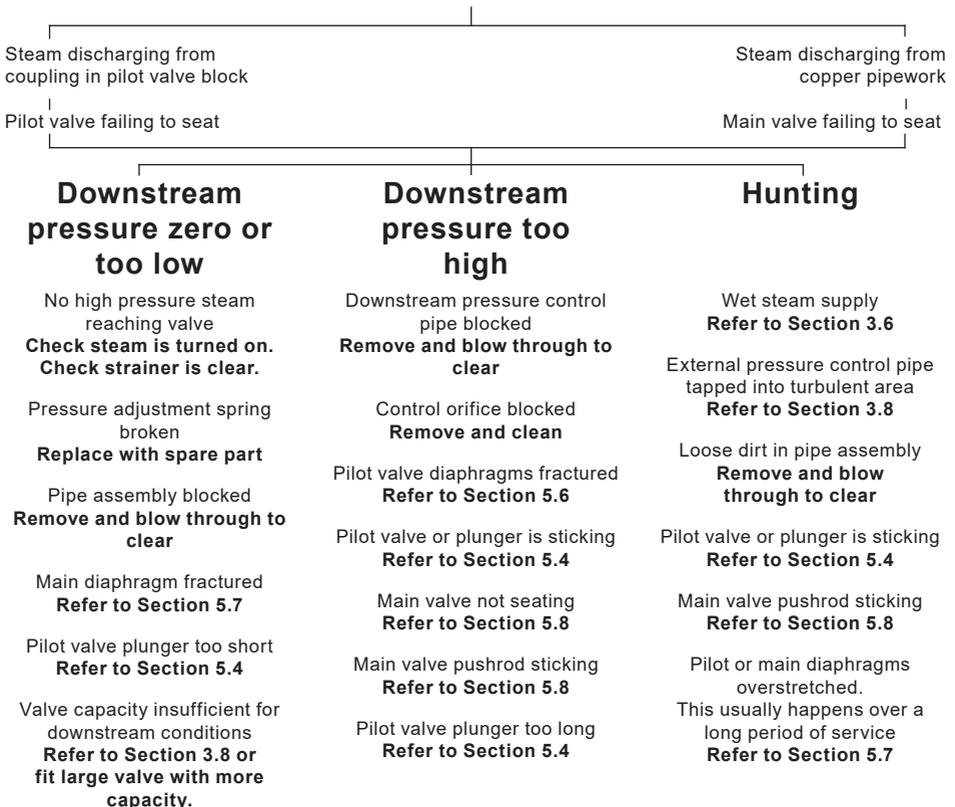
This is its normal function and does not indicate failure of the pressure control unit.

If the pressure control unit is in anyway suspect then before proceeding with any tests it is essential to remove the sensor bulb and allows it to cool down, thus ensuring that the temperature control pilot valve is fully open. For this reason trouble tracing is divided into two sections separating the pressure and temperature control functions.

## Pressure control system

### Preliminary check

- 7.1 Isolate valve and zero pressure.
- 7.2 Remove sensor bulb and allow it to cool down.
- 7.3 Release lock-nut and turn adjustment screw anti-clockwise until spring is slack.
- 7.4 Undo union nut and release pipework.
- 7.5 Turn on steam slowly.



## Temperature control system

### 7.6 Temperature in plant too high.

A rise in temperature above the normal control setting could be caused either by the valve failing to shut-off or a break down in the control system. Check as follows:-

### 7.7 With the plant up to temperature and steam on to the valve remove the sensor bulb and allow it to cool. Undo the three screws and remove the control head.

This will release all pressure on the pilot valve plunger and the valve should be in the open position.

### 7.8 This plunger can be depressed and released by hand to check the operation of the valve, depression of the plunger causing the main valve to close and the temperature in the plant to fail.

### 7.9 If this check indicates that the valve is closing properly the fault must lie in the control system which should be replaced as Section 5.10.

If the check shows that the valve is not closing properly this could be caused by one of the following:

Control orifice is blocked. For access remove pipe assembly and clear orifice with fine wire. (Do not use a drill or any other tool which will enlarge this orifice).

Pilot valve is not seating. Examine and clean. For access see Section 5.9. Before stripping down to check on either the pilot or main valve see Sections 7.10 to 7.14 which follows.

Main valve is not seating or the main valve pushrod is sticking. Examine and clean. For access see Section 5.8. Before stripping down to check on either the pilot or main valve see Sections 7.10 to 7.14 which follows.

## To check on valve closure

### 7.10 With the plant up to temperature isolate the valve and zero pressure.

### 7.11 Turn the adjustment knob to a lower temperature to ensure that the main valve should be fully closed.

### 7.12 Undo pipe union in pilot valve housing.

### 7.13 Turn steam on to valve slowly.

### 7.14 If steam is discharged through the tapped hole in the pilot valve housing from which the union has been unscrewed it indicates that the pilot valve is failing to seat.

See Section 5, Steps 65 - 73. If steam is discharged through the exposed end of the copper pipe it indicates that the main valve is failing to seat. See Section 5, Steps 38 - 64.

## Temperature in plant too low

### 7.15 If the temperature in the plant is below the normal control setting this could be caused by one of the following:

### 7.16 Lack of steam supply. Check that steam is turned on and that the strainers are clean.

### 7.17 Pipe assembly blocked. Remove by uncoupling unions and blow through to clear obstruction.

### 7.18 Diaphragm fractured.

## Pilot valve packless gland leaking

### 7.19 If, with the control head removed and steam on the valve, steam is seen to be leaking from the top of the hexagon nut it indicates failure of the packless gland.

Replace as Section 5.9.

