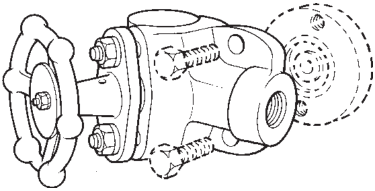
1283050/4

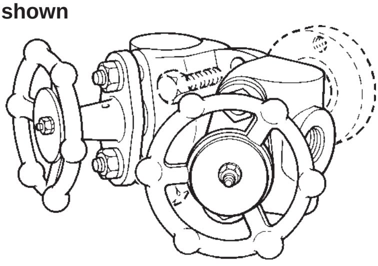
IM-P128-06
ST Issue 4

PC3_ and PC4_ Pipeline Connectors

Installation and Maintenance Instructions



PC30 shown



PC40 shown

1. Safety information

2. Description

3. Installation

4. Welding of pipeline connector

5. Maintenance

6. Depressurisation of pipework

7. Available spares

1. Safety information

1.1 PC3_ and PC4_ pipeline connectors

Pressure

Before attempting any maintenance of pipeline connectors, ensure that any pressure is isolated and safely vented to atmospheric pressure before attempting any maintenance program. This is easily achieved by fitting Spirax Sarco depressurisation valves type DV (see Section 1.2 below and Section 6). Do not assume that the system is depressurised even when a pressure gauge indicates zero.

Temperature

Allow time for temperature to normalise after isolation to avoid the danger of burns and consider whether protective clothing (including safety glasses) is required.

Isolation

Consider whether closing isolating valves will put any other part of the system or personnel at risk. Dangers might include; isolation of vents, protective devices or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.2 DV1 and DV2 depressurisation valves

Pressure

DV1 and DV2 valves are generally used to depressurise a system / vessel prior to maintenance or removal. Do not assume that the system has depressurised even if a pressure guage indicates zero. Consider the direction of the depressurised flow and ensure that this will not cause a hazard to yourself or others.

Temperature

Allow time for temperature to normalise after depressurisation to avoid danger of burns.

Tools and consumables

Before operating DV1 or DV2 valves ensure that you have the correct tools available.

Protective clothing

Consider whether any protective clothing is required by yourself or others to protect against noise, pressure or hot discharge / burns.

1.3 Disposal

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

2.1 General

Pipeline connectors type PC3_ and PC4_ have integral piston valves (for further details see Technical Information Sheet TI-P128-03 and TI-P128_02).
A leaktight seal in the piston valve is obtained by a piston, operated by a handwheel and a threaded spindle, moving through two sealing rings separated by a lantern bush. With the piston fully retracted and held only by the upper sealing ring (ensuring no leak path to the environment) the valve is open. With the piston fully inserted and held also by the lower sealing ring (ensuring no leak path between the valve inlet and outlet), the valve is closed. The lantern bush allows flow through the valve whilst maintaining separation between the two sealing rings. Consequently the valve is soft seated, with contact between the piston and rings assured by the stud bolts and the special patented material / composition of the sealing rings (laminated graphite / stainless steel) compensating pressure and temperature variations.

Other features of the piston valve are:

- Only when the flow is already cut off do the two cylindrical seating surfaces (lower sealing ring and piston) come into contact.
- The piston is always held by at least one ring ensuring no vibration during opening and closing.
- The piston is protected against erosive corrosive actions and depositing of foreign matter when the valve is completely open, being totally retracted through the upper sealing ring.

2.2 Operation

The integral piston valves should be either fully open or fully closed. They are not intended for throttling duties. The rising stem of the integral piston valves provides an indication of the amount of valve opening.

During closing operation the piston ensures a permanent seal by means of the handwheel. Therefore during service never remove the handwheel from the spindle. Due to the large sealing area of the piston valve, it is not necessary to use a valve key to ensure leaktight shut-off.

During opening operation the piston is stopped when the valve is fully open as its top touches the inside of the bonnet.

Operation of the handwheel should always be light.

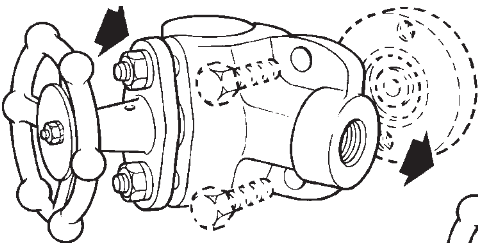


Fig. 1 PC30 shown

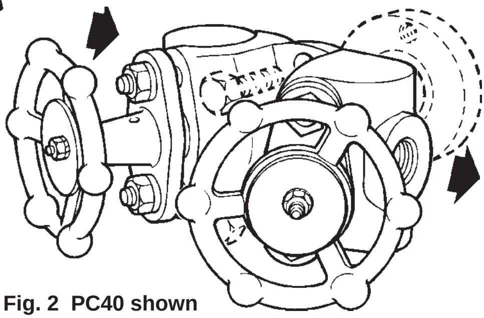


Fig. 2 PC40 shown

3. Installation

Note: Please read 'Safety information', Section 1, before commissioning.

3.1 General

There are two criteria which must be satisfied to ensure that the swivel connector trap will operate correctly and ensure effective condensate removal:

- The PC3_ / PC4_ shall be installed with the flow in the direction of the arrow on the connector body. Flow can be horizontal (either direction), vertical or inclined.
- The connection face for the swivel connector steam trap must always be in the vertical plane.

Ensure that there is sufficient access to the handwheel to allow proper operation.

After installation it is recommended that the pipeline connector is insulated to minimise radiated heat losses and to protect personnel from burns risk.

Note: some trap types should not be insulated.

The PC and trap are joined by a high integrity spirally wound gasketed joint. It is important that no damage is caused, e.g. by weld, weld splatter, knocks, etc. to the trap gasket face.

Hence care must be taken when installing the PC into the pipework. It is recommended that the trap is installed immediately the PC is in the pipework. Alternatively, the trap can be joined to the PC prior to installation.

3.2 Welding into pipeline of socket weld variants (Refer to Section 4)

A universal weld procedure covering the requirements of different National and International Standards and practices is difficult to provide - specifically regarding the welding procedure, welding conditions (run number, consumable size, current, voltage, polarity), storage of consumables and make / type of consumables due to the abundance of appropriate consumable suppliers.

Therefore, this is only advice based on British Standards to be used for guidance on the essential requirements of welding socket weld pipeline connectors into the pipeline.

It is intended that the PC3_ connector should only be used on systems where the steam trap discharges directly to atmosphere. If there is any back pressure a separate downstream isolation valve and depressurisation valve should be considered.

The PC4_ connector is recommended for all applications in a closed system.

4. Welding of pipeline connector

Note: This is only advice based on British Standards.

The welding of pipeline connector DN15 and DN20 socket weld to pipe DN15 and DN20 schedule 80

Parent material(s)

Description

PC3_, **PC4_** Austenitic stainless steel with minimum tensile strength up to and including 485 N / mm²

Pipe - Carbon steel with minimum tensile strength up to and including 430 N / mm²

Specification(s)

ASTM A182 F304L (PC3_, PC4_)
ASTM A106 Gr B (Pipe)

Material group(s)

R
A1

Parent material(s) dimensions

	DN15		DN20	
	PC	Pipe	PC	Pipe
Thickness (mm)	8.85	3.73	5.50	3.91
O/D (mm)	39.00	21.30	39.00	26.70

Pipe is to be BS 1600 Schedule 80

Joint type

Socket joint to BS 3799 Class 3000 lb

Welding process

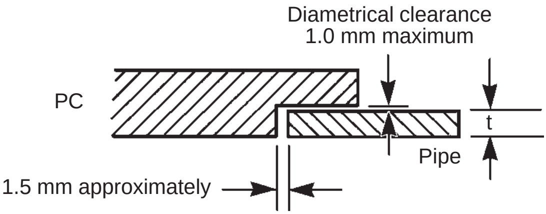
Manual Metal Arc (MMA)

Welding positions(s)

All: Site welded

Weld preparation

Dimensioned sketch



Reference - BS 2633: 1987: Section 3.1 and Fig. 9

Welding consumables

Filler material:
Composition - Low C: 23% Cr: 12 % Ni:
Specification - BS 2926: 1984: 23-12 L BR

Shielding gas/flux:
Not applicable

Method of preparaton and cleaning

Socket: As supplied and wire brushed.
Pipe: Mechanically cut and wire brushed.

Additional information

1. It is not necessary to dismantle PC prior to welding.
2. Fit-up using tack welds.

Parent material temperature

Preheat temperature
Only required when ambient is below 5°C then "warm to touch"

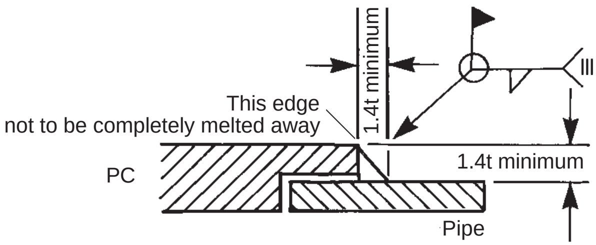
Interpass temperature
Not applicable

Post-weld heat treatment

None required

Run sequence and completed weld dimensions

Sketch



Reference.- BS 806: 1990: Section 4: Clause 4.7.3

5. Maintenance

Note: Before actioning any maintenance, read 'Safety information', Section 1.

5.1 Introduction
All work must be carried out by a suitably competent person. Before starting work ensure that suitable tools are available. Use only Spirax Sarco replacement parts.

5.2 Maintenance in service
After the pipeline connector is first put into service or after a change of sealing rings, the bonnet nuts (**11**) should be lightly tightened with the valve in the closed position. Ensure the bonnet (**9**) is driven down straight during tightening and that care is taken with the handwheel operation. This operation is to be repeated should any trace of leakage develop. If perfect sealing cannot be achieved in this way, repack the valve following the procedure below.
A small diameter hole evident in the valve bonnet is primarily to prevent pressurisation within the bonnet, but is useful for observing leaks past the upper sealing ring and for lubrication of the spindle (**6**) when the valve is closed.

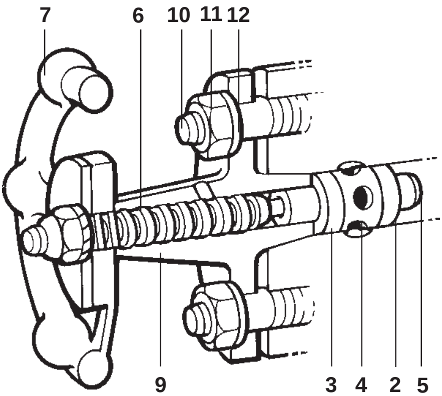


Fig. 3 View showing valve internals

5.3 Preparation of valve dismantling
If performing maintenance whilst the pipework is hot, wear appropriate protective clothing. Carefully remove insulation if fitted. It is not necessary to remove the steam trap prior to dismantling the valve.

5.4 Dismantling the valve:
- Using the handwheel (**7**), fully open the valve.
- Remove the bonnet nuts (**11**) and washers (**12**) from studs (**10**).
- Carefully turn the handwheel in the closing direction to lift the bonnet (**9**).
- Rotate the bonnet (**9**) to ensure that the flange bolt holes are misaligned with the studs (**10**).
- Turn the handwheel in the opening direction to release the piston (**5**) from the sealing rings (**2** and **3**) and so release piston/bonnet sub-assembly from the body (**1**).
- The piston (**5**) is attached to the spindle (**6**) using a ball and socket joint as supplied, therefore they should never be separated.
- Examine the piston (**5**) for signs of scoring, corrosion etc. which could affect perfect tightness of the valve.
- Check other parts for wear/damage and replace if necessary.

5.5 Repacking the valve:

- With the valve dismantled, insert the valve internals extractor tool through the sealing rings (**2** and **3**) and lantern bush (**4**).
- Firmly tap to ensure that the tool bottoms out in the bore and with a quarter turn of the handle carefully remove the two sealing rings (**2** and **3**) and the lantern bush (**4**).
- Thoroughly clean the sealing rings housing and all the internals.
- Fit new lower sealing ring (**2**), lantern bush (**4**) and upper sealing ring (**3**), ensuring they fit perfectly. (**Note:** The lower and upper rings are the same.)
- Apply a thin layer of graphite based grease to threads only (not to internals and piston).

5.6 Reassembling the valve:

- Take the piston/bonnet sub-assembly and turn the handwheel (**7**) in the opening direction up to the stop.
- Insert piston (**5**) into the upper sealing ring and push it down until it is possible to fit washers (**12**) and screw bonnet nuts (**11**) onto the studs (**10**) and then hand tighten.
- Shut the valve fully, ensuring that the bonnet (**9**) is driven down straight, gradually tighten the bonnet nuts (**11**) to the recommended torque of 10 N m.
- Replace any insulation.

5.7 Replacement of steam traps and depressurisation of pipeline

- See Section 6.

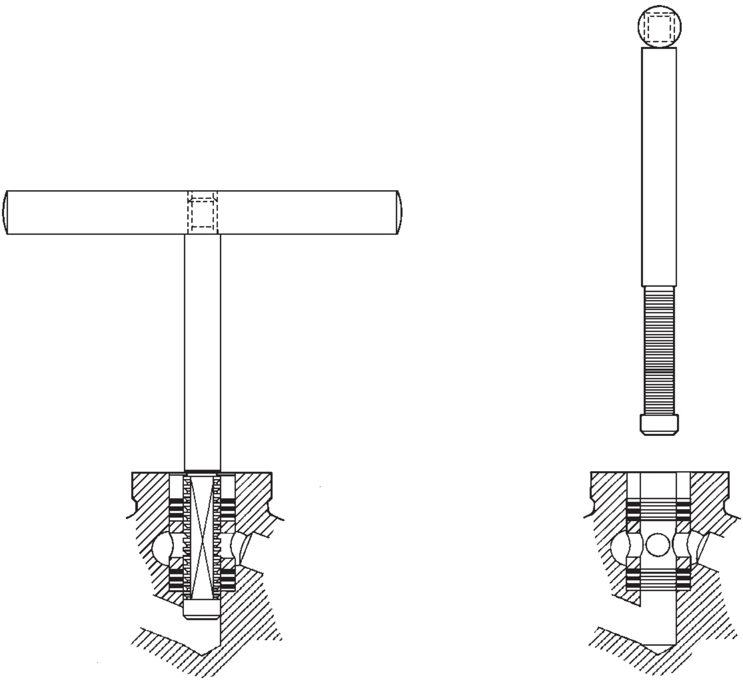


Fig. 4 View showing valve internals extractor tool

6.1 Operation of DV1 and DV2 when fitted to: PC33, PC34, PC35, PC43, PC44, PC46 and PC47 pipeline connectors.

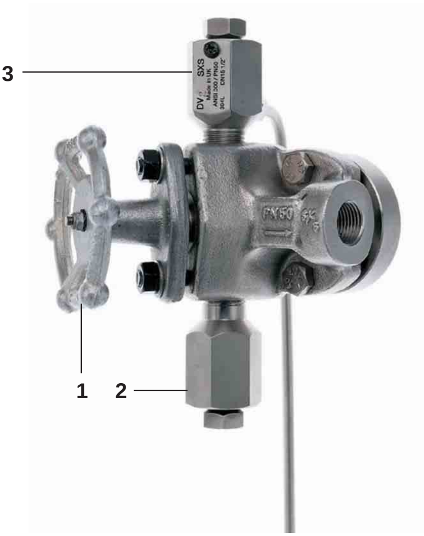
DV1 and DV2 valves are fitted to PC3_ or PC4_ series pipeline connectors to provide safe and reliable venting/bypass for the steam traps installed.

DV1	Normally fitted to upstream drains and/or downstream test connections. (DV2's can be fitted if a piped discharge is required).
DV2	Always fitted to upstream trap vent connections, to ensure a safe downward discharge.

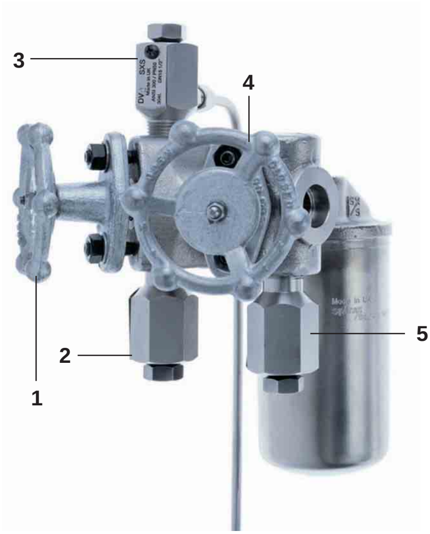
For further details on the operation of DV valves see TI-P600-01 and IM-P600-02.

Note: It is important to ensure that the discharge from all DV1 and DV2 valves are directed to a safe position and that correct safety precautions are taken when operating the valves. (See Section 1,'Safety information').

PC33 shown



PC43 shown



1. Upstream isolation
2. Upstream line drain (where fitted) - DV1 or DV2
3. Steam trap vent (where fitted) - DV2
4. Downstream isolation
5. Downstream trap test - DV1 or DV2

Fig. 5 Depressurisation valves

6.2 To remove / replace a steam trap fitted to: PC30, PC33, PC34 or PC35 pipeline connectors:

- Close the upstream isolation valve (**1**).
- If fitted, open the line drain valve DV (**2**) to keep the steam line drained.
- If fitted on a system which does not discharge directly to atmosphere, ensure that any downstream pressure is isolated and depressurised before continuing. A PC4_ connector should be considered.
- If fitted, open trap vent valve DV (**3**) to relieve pressure (**Note**: **Under no circumstances should the lock set screw be removed as it prevents blow out at the valves screw**).
- If no DV valves are fitted, carefully undo the two trap retaining bolts ensuring that any trapped steam / condensate can safely bleed away.
- After removal of the plastic protector (on new traps) replace the steam trap and tighten the bolts to the recommended torque.
- Close valve DV (**2**) and (**3**) and then slowly open valve (**1**) checking for leaks.
- If no leaks are detected open valve (**1**) completely.

6.3 To remove / replace a steam trap fitted to: PC40, PC43, PC44, PC45, PC46 or PC47 pipeline connectors:

- Close the upstream and downstream isolation valves (**1**) and (**4**).
- If fitted, open the line drain valve DV (**2**) to keep the upstream line drained.
- If fitted, open the trap vent valve DV (**3**) and trap test valve DV (**5**) to relieve pressure (**Note**: **Under no circumstances should the lock set screw be removed as it prevents blow out at the valves screw**).
- If no DV valves are fitted, carefully undo the two trap test retaining bolts ensuring that any trapped steam / condensate can carefully bleed away.
- After removal of the plastic protector (on new traps), replace the steam trap ensuring the gasket and gasket faces are clean, tighten the bolts to the recommended torque.
- Close DV valves (**3**) and (**5**) and the close line drain valve DV (**2**).
- Open valve (**4**) fully, then slowly open valve (**1**) checking for leaks.
- If no leaks are detected open valve (**1**) completely.

6.4 Steam trap testing

The DV valve (**5**) (on PC4_ series only) can be used for steam trap testing. Open the valve screw and observe the discharge from the valve to ensure correct operation of the steam trap (**Note**: **Under no circumstances should the lock set screw be moved as it prevents blow out at the valve screw**). When observation is complete close the screw and tighten to the recommended torque.

6.5 Recommended tightening torques

Item	or mm		N m	(lbf ft)
11	14 UNC	$^5/_{16}$" x 18	10-11	(7-8)
8	10	M6	0.1	(0.07-0.08)
20	$^9/_{16}$"		30-35	(22-25)
21	19		40-45	(29-33)

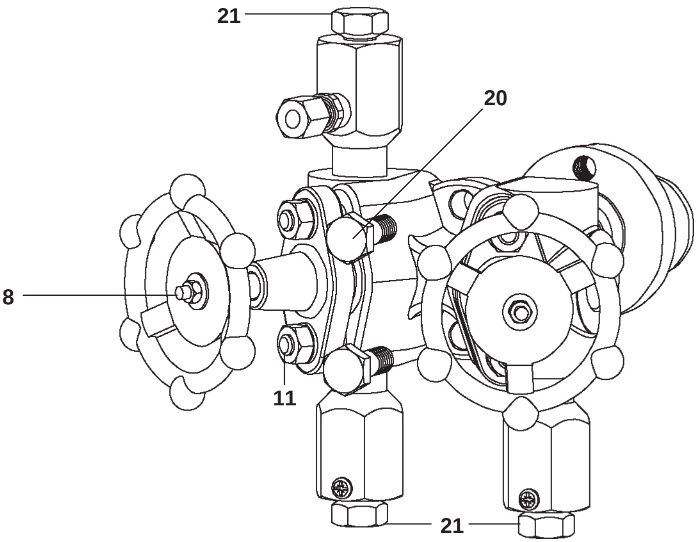


Fig. 6 PC43 shown

7. Available spares

The spare parts available are shown in heavy outline. Parts drawn in broken line are not supplied as spares. For ease of replacement an extractor tool is available for removing the sealing rings.

Available spares		
Sealing ring set		**2**, **3**
Valve internals set, consisting of:	Sealing ring set	**2**, **3**
	Lantern bush	**4**
	Piston with spindle	**5**, **6**
	Handwheel nut	**8**
	Washer	**13**
Extractor tool	Not shown see Fig. 4, page 5 for more detail	

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

Example: 1 off Sealing ring set for integral piston valve on a PC3_ pipeline connector having DN15 socket weld connections.

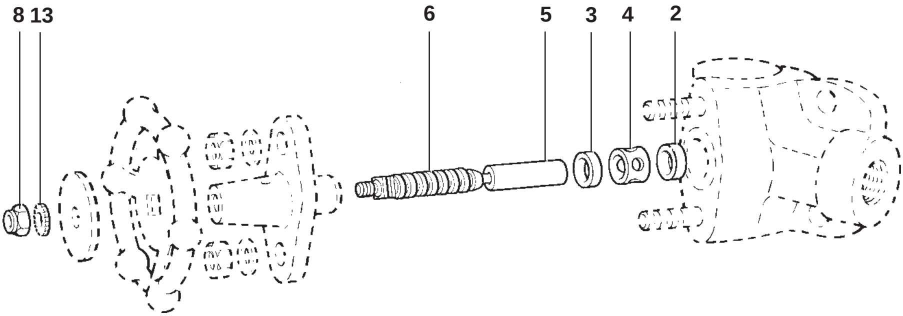


Fig. 7