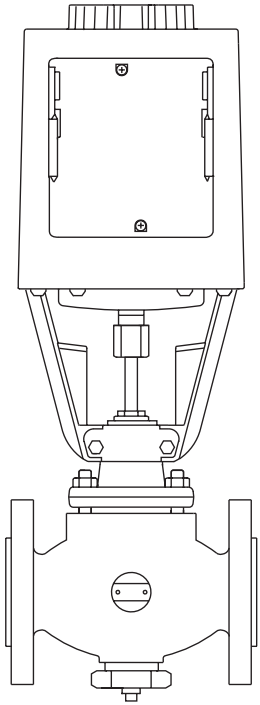
IM-P403-73
AB Issue 3

BCV30
DN40 - Blowdown Control Valve
Installation and Maintenance Instructions



1. Safety information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11 on this document) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

WARNING

Your attention is drawn to any National or Regional regulations concerning boiler blowdown. In the UK, guidance is given in HSE Guidance Note PM60.

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Maintenance Instructions, could cause damage to the product, will invalidate the CE marking, and may cause injury or fatality to personnel.

Before commencing any dismantling work on the boiler, depressurise, drain, and vent the boiler to atmosphere.

Pipelines must be adequately isolated, depressurised, and drained.

Isolation valves must be turned on and off gradually to avoid system shocks.

The actuator must be isolated both pneumatically and electrically before any maintenance is carried out.

The actuator must be vented before dismantling.

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 1 Gases	Group 2 Gases	Group 1 Liquids	Group 2 Liquids
BCV30	DN40	-	1	-	SEP

i) The products have been specifically designed for use on steam, air or condensate which are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other fluids may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) **Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.**

v) **Remove protection covers from all connections 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 250°C (482°F).
Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.16 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. Application

The BCV30 is an electrohydraulically actuated control valve for the blowdown of steam boilers and is generally used with a controller as part of an automatic TDS control system.
The valve may also be used for other high pressure drop flowrate applications such as boiler feedpump recirculation.

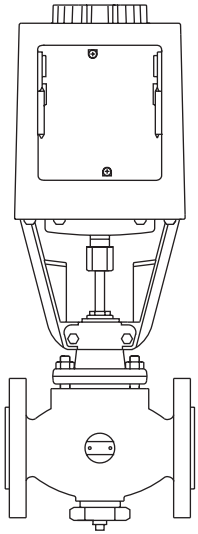
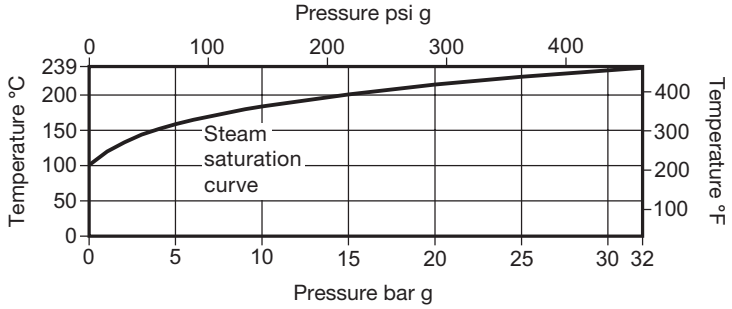


Fig. 1

3. Technical data

Pressure / temperature limits



Maximum operating pressure	32 bar g	(464 psi g)
Maximum operating temperature	239°C	(462°F)
Maximum ambient temperature	110°C	(230°F)
Minimum ambient temperature	0°C	(32°F)
Minimum operating temperature	0°C	(32°F)

4. Operation

The valve is spring loaded to the closed position (0 on the actuator scale, see Figure 2) and is also held closed by the boiler pressure. When power is applied to actuator terminals 21 and Y1 via terminals 3 and 5 of microswitch C1 (see Figure 6, page 10) the valve opens to the position set by the internal adjustment cam.
The valve is supplied with a flowrate setting of 10 mm (0.4") stroke. The internal adjustment cam may be readjusted to give various strokes for increased or decreased flowrates (see Figure 2 below). The valve may be opened manually by turning the actuator handwheel clockwise. For automatic operation the handwheel must be turned fully anticlockwise until the 'MAN' indicator is no longer visible.

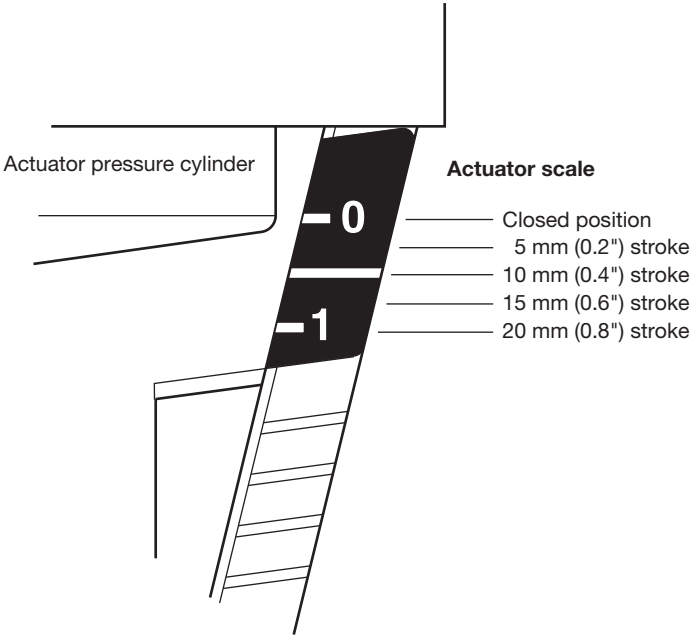


Fig. 2 Actuator adjustment - shown in the closed position
(For further information see Section 8.2)

5. Installation

The actuator should be protected from excessive heat.
Actuator sealing is to IP54. Additional protection is recommended for outdoor installation.
The valve may be installed in horizontal or vertical lines with flow in the direction of the arrow.
Do not install with the actuator below the valve. For boiler blowdown applications the ideal take-off point for the blowdown is from a boiler side connection (Figure 3), to reduce the possibility of scale entering the blowdown valve. If the bottom connection has to be used, make a 'T' connection upstream of the main bottom blowdown valve as shown in Figure 4. We recommend that where possible the 'T' is taken off the top of the blowdown line to reduce any problems of scale.
The ¼" BSP plug may be removed and the connection used for boiler water sampling. A sample cooler is recommended.
Fit a stop valve between the boiler and the BCV30. A check valve is recommended downstream of the BCV30. **For single boiler installations** the blowdown may discharge into the main blowdown line downstream of the main blowdown valve. In the UK, regulations for multi-boiler installations require the automatic blowdown lines to be separate from the main blowdown lines. For further information see Health and Safety Executive Guidance Note PM60.

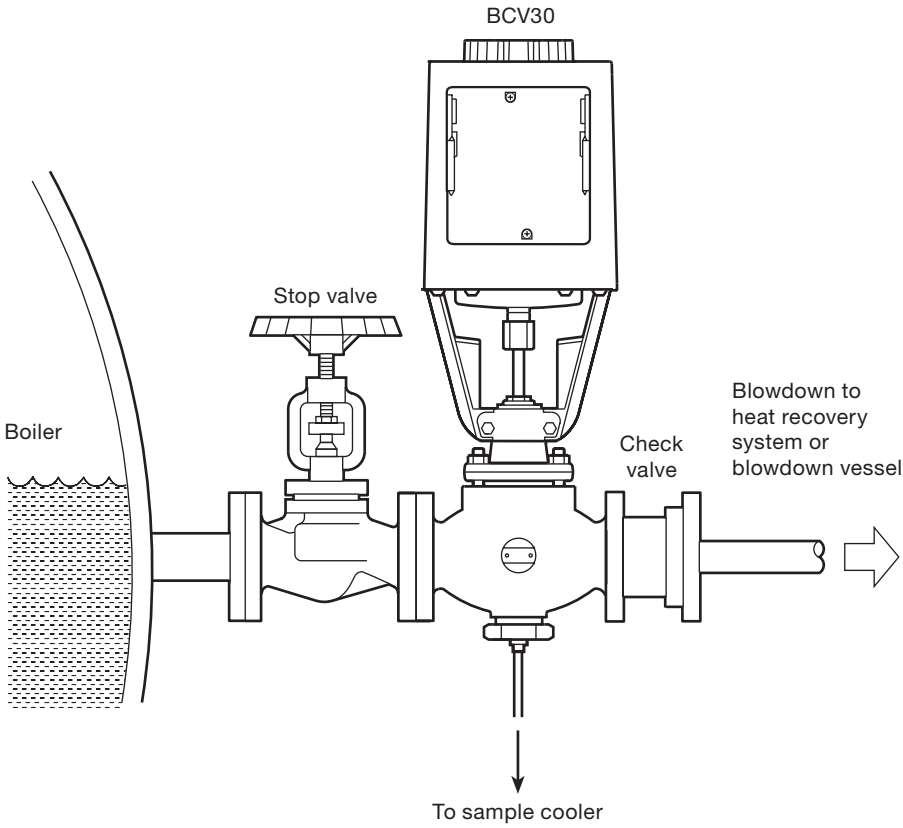


Fig. 3 Installation on a boiler side connection

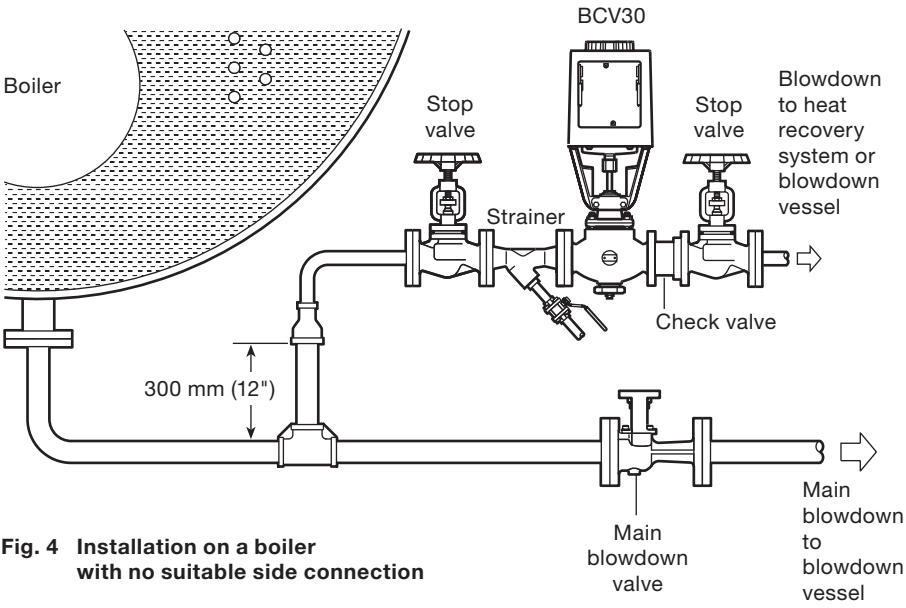


Fig. 4 Installation on a boiler with no suitable side connection

6. Rotating the actuator

The actuator may be rotated on the valve body so that the terminal cover points in the most convenient direction. To rotate the actuator proceed as follows:
Turn the actuator handwheel a few turns clockwise to ensure that the valve cone is off its seat. Loosen the two clamping bolts (10 mm A/F). Rotate the actuator as required and clamp in position. Turn the actuator handwheel fully anticlockwise until the 'MAN' indicator is no longer visible.

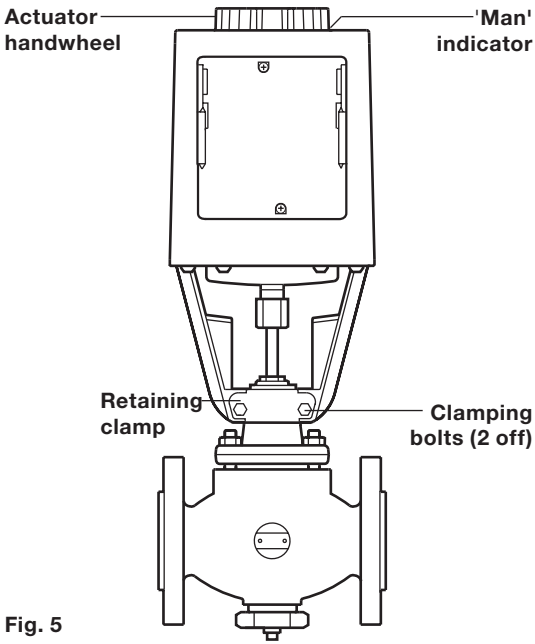


Fig. 5

7. Wiring

All wiring materials and methods shall comply with relevant EN and IEC standards where applicable. For installations in the US and Canada, the controller and valve must be wired in accordance with the Local and National Electrical Code (NEC) or the Canadian Electrical Code (CEC).
Check the actuator label to ensure the operating voltage is correct for the mains supply.

Suitable ac voltages are:-

230 V version	195 V - 264 V
24 V version (UL)	19.2 V - 28 V
Frequency	50 - 60 Hz
Maximum power consumption	15 VA

Any suitable 3 core cable may be used.
A conductor size of 1 mm² or 1.5 mm² is ideal.
Maximum conductor size 2 mm² (14 AWG) - 24 V version.
4 off Pg 11 (UL Listed ½" NPSM) size cable entries are provided.
Connect the wiring as shown in the diagram.
Note: 24 V actuators do not need to have an earth connection.

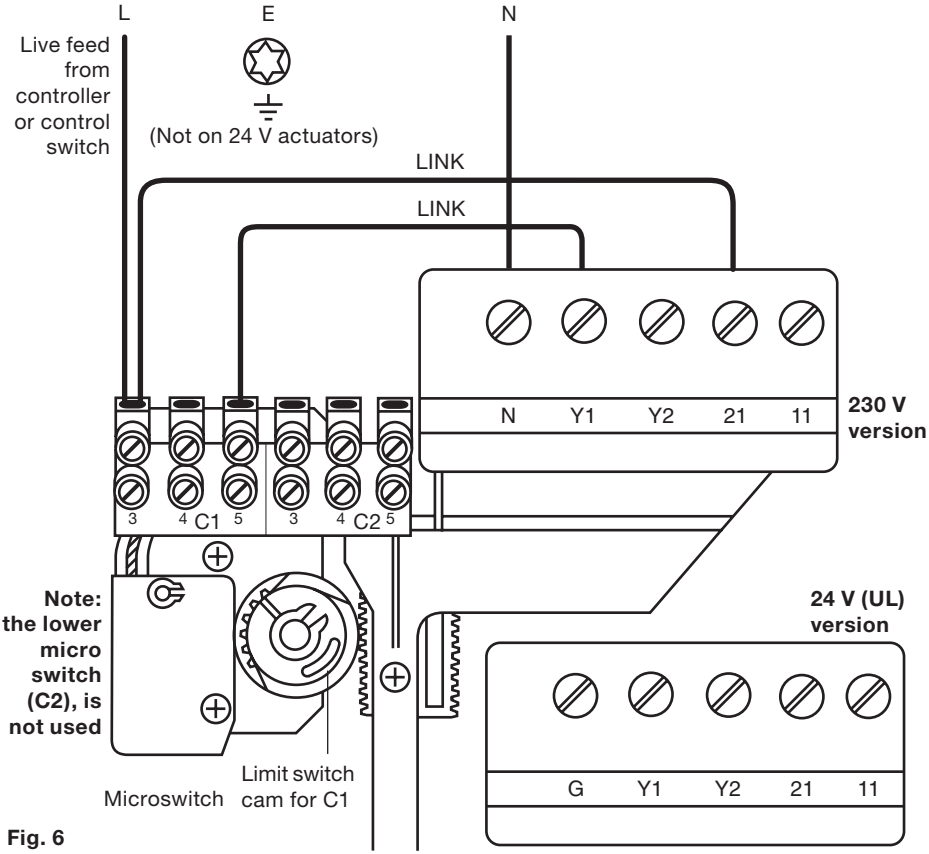


Fig. 6

8.1 Limit switch assembly

The BCV30 is supplied with a limit switch assembly already fitted, and adjusted to a flowrate setting of 10 mm (0.4") stroke. For different flowrates, the internal cam is adjusted to operate at various valve strokes to give the required blowdown valve capacity (see Table 1 below).

8.2 Adjustment - resetting the stroke

- Use Table 1 below to find the stroke setting which gives the required blowdown rate.
- Turn the actuator handwheel to set the valve to the required stroke (5 mm [0.2"], 10 mm [0.4"], 15 mm [0.6"], or 20 mm [0.8"]). **Intermediate strokes can be selected.**
- Turn the top limit switch cam (by hand or with a screwdriver in the curved slot) anticlockwise until the cam is not operating the top micro switch (C1).
  Note that the lower micro switch (C2), is not used.
- Turn the cam slowly clockwise until the top micro switch just operates (audible click).
  Confirmation of micro switch operation may be made with a continuity meter.
  When the switch operates, C1 terminals 3 and 5 will change from closed to open circuit, and terminals 3 and 4 will change from open to closed circuit.
- Turn the actuator handwheel fully anticlockwise so that the 'MAN' indicator is not showing.
- Replace the actuator cover, switch on the power supply, and confirm that the stroke is correct. Once set, the valve may be opened manually to temporarily increase the blowdown rate or to purge the system.

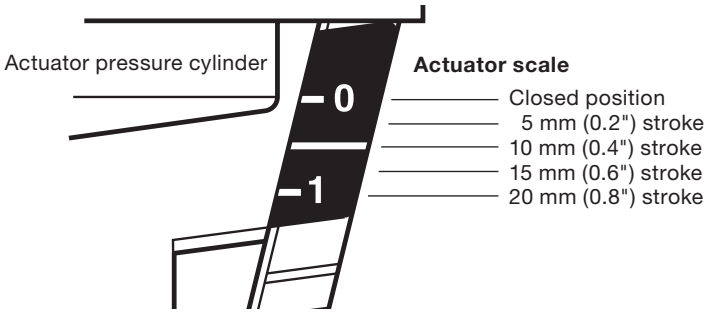


Fig. 7 Actuator adjustment - shown in the closed position

Table 1 Blowdown valve capacities

Boiler pressure		Blowdown valve capacity kg/h (lb/h)							
		5 mm (0.2") stroke		10 mm (0.4") stroke		15 mm (0.6") stroke		20 mm (0.8") stroke	
bar g	psi g								
5.0	**72.5**	450	(990)	2 900	(6 380)	3 450	(7 590)	3 550	(7 810)
7.0	**102.0**	475	(1 045)	3 300	(7 260)	4 100	(9 020)	4 500	(9 900)
10.0	**145.0**	500	(1 100)	3 700	(8 140)	4 750	(10 450)	5 450	(11 990)
15.0	**218.0**	550	(1 210)	4 550	(10 010)	6 450	(14 190)	7 150	(15 730)
20.0	**290.0**	800	(1 760)	5 750	(12 650)	8 100	(17 820)	8 650	(19 030)
32.0	**464.0**	1 300	(2 860)	8 400	(18 480)	10 300	(22 660)	11 050	(24 310)

Note: Intermediate flowrate strokes can be set on the DN40 BCV30.

9.1 Materials

No.	Description
1	Actuator handwheel
3	Seat
4	Gasket (seat)
6	valve plug
7	Stem
8	Circlip

No.	Description
9	Gasket
13	Gasket
20	Guide bush
22	Gasket
23	Plug ¼" BSP
26	Actuator (includes limit switch)

No.	Description
27	Limit switch assembly
40	Bottom support ring
41	Graphite stem seal set
42	Top support ring
43	Stuffing box
44	Gland nut

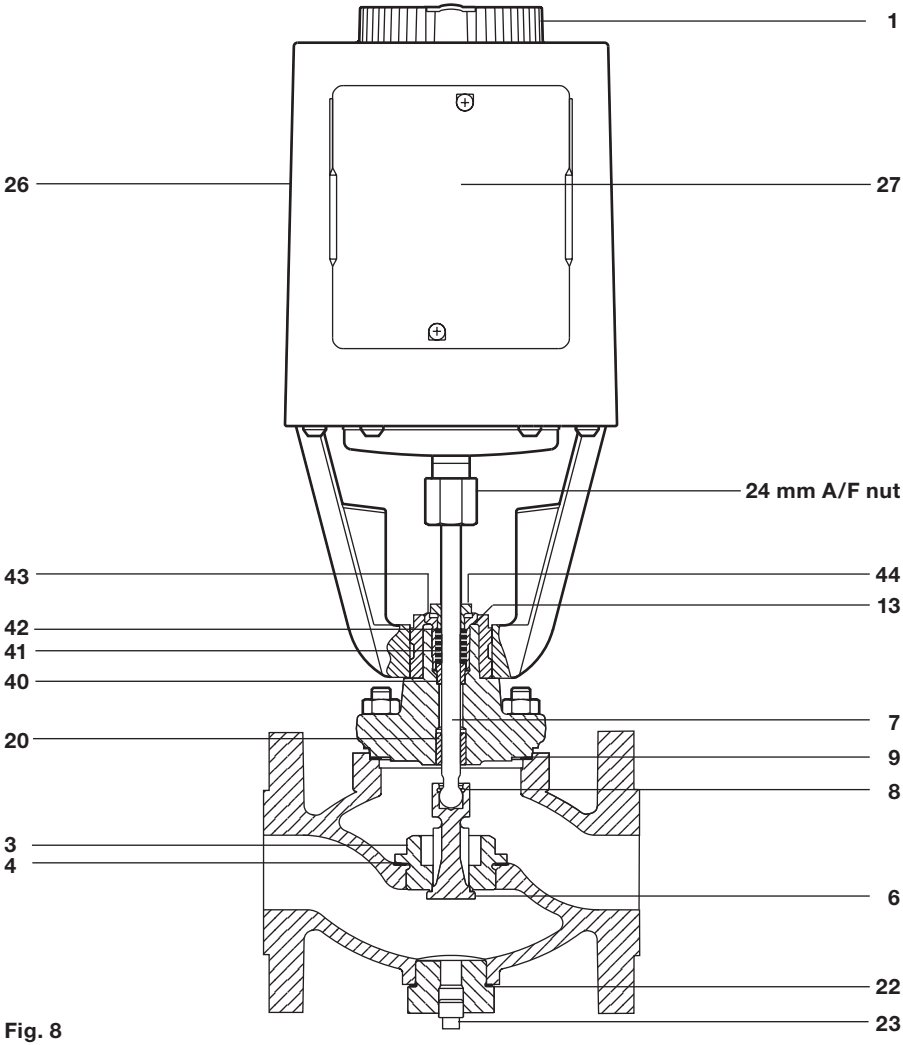


Fig. 8

No routine maintenance is required. The standard valve stem is sealed by packing rings which can be adjusted if any leakage should occur at the valve stem.

9.2 To adjust the valve stem seal:

- Turn the adjustable gland nut (**44**) clockwise one flat (60°) at a time, then operate the valve several times. Repeat if still leaking.

9.3 To replace the valve stem seal:

- Remove the actuator (**26**).
- Remove and discard the five existing adjustable graphite packing rings (**41**).
- Ensure the valve stem and bonnet are clean.

9.3.1 If the new seal set is supplied assembled into the stuffing box:

- Fit the bottom support ring (**40**) over the valve stem and locate in the valve bonnet with its small diameter downwards.
- Fit the stuffing box gasket (**13**) to the stuffing box (**43**), and pass the stuffing box assembly over the valve stem (**7**).

  WARNING: Handle the gasket with care - it is fragile, and has a sharp reinforcement.
- Screw the stuffing box into the valve bonnet and torque to 25 - 30 N m (18 - 22 lbf ft).
- Ensure the gland nut (**44**) is finger tight against the top support ring (**42**), then move the valve stem up and down over its full travel five or six times to bed in the packing rings.
- Tighten the gland nut by two flats (120°).
- Reassemble the actuator, pressurise the system, and operate the valve five or six times.
- Adjust the gland nut to stop any leaks (see Section 9.2).

9.3.2 If the new seal set is supplied as separate components:

- Fit the top support ring (**42**), chamfer first, into the stuffing box (**43**).
- Fit the five packing rings (**41**) into the stuffing box from below, so the thread in the top of the stuffing box cannot damage the rings. Ensure that the splits in the packing rings are staggered.
  Tip:- Use the bottom support ring (**40**) as a temporary tool to push the packing rings into place.
- Fit the bottom ring support over the valve stem (**7**) and locate in the valve bonnet with its small diameter downwards.
- Fit the gland nut (**44**), and tighten finger-tight only at this stage.
- Fit the stuffing box gasket (**13**) to the stuffing box, and pass the stuffing box assembly over the valve stem.

  WARNING: Handle the gasket with care - it is fragile, and has a sharp reinforcement.
- Screw the stuffing box into the valve bonnet and torque to 25 - 30 N m (18 - 22 lbf ft).
- Move the valve stem up and down over its full travel five or six times to bed in the packing rings.
- Tighten the gland nut by two flats (120°).
- Reassemble the actuator, pressurise the system, and operate the valve five or six times.
- Adjust the gland nut to stop any leaks (see Section 9.2).

9.4 How to replace the valve plug, seat and stem set

Removal:

- Isolate and depressurise the valve assembly.
- Manually turn the actuator handwheel clockwise until the stem can be seen moving downward.
- Unscrew the 24 mm A/F nut connecting the stem to the actuator cylinder (see Figure 8), remove and retain both the thrust washer and the 24 mm A/F nut.
- Unscrew the actuator clamping bolts and remove the retaining clamp (see Figure 5).
- Remove the actuator from the mounting adaptor.
- Manually push down the stem (**7**) and plug assembly (**6**) until it abuts the bottom cover.
- Unscrew and remove the bottom cover and the 'S' type gasket (**22**).
- Remove the stem and plug assembly from the valve body via the bottom cover port.
- Unscrew and remove the M10 nuts, bonnet and gasket (**9**).
- Unscrew the valve seat (**3**) and remove the gasket (**4**).

Assembly:

- Ensure all the gasket sealing faces are clean and free from damage.
- Fit the new gasket (**4**) and new valve seat (**3**). Torque load the seat to 150 N m (110 lbf ft).
- Insert the new stem (**7**) and plug assembly (**6**) into the valve seat (**3**).
- Fit the new 'S' type gasket (**22**) and bottom cover. Torque load to 150 N m (110 lbf ft).
- Fit the new bonnet gasket (**9**) and bonnet over the stem (**7**). Secure with M10 nuts finger tight.
- Pull the stem (**7**) adaptor upward toward the actuator coupling until the valve plug abuts the seat.
- Locate the actuator on the mounting adaptor. Secure with the retaining clamp (see Figure 5).
- Torque load the clamping bolts to 6 N m (4.5 lbf ft).
- Position the 24 mm A/F nut over the stem and position the thrust washer into the stem undercut.
- Manually turn the actuator handwheel clockwise until the pressure cylinder is at 20 mm (0.8") stroke.
- Fit the 24 mm A/F nut to the threaded connection of the pressure cylinder.
- Manually turn the actuator handwheel anticlockwise until the manual indicator tab retracts.
- Torque load the M10 bonnet nuts to 50 N m (37 lbf ft).
- If necessary refer to Section 8 for stroke adjustment.

9.5 How to replace the actuator

Removal:

- Isolate and depressurise the valve assembly.
- Manually turn the actuator handwheel clockwise until the stem can be seen moving downward.
- Unscrew the 24 mm A/F nut connecting the stem to the actuator cylinder, remove and retain both the thrust washer and 24 mm A/F nut.
- Unscrew the actuator clamping bolts and remove the retaining clamp (see Figure 5).
- Remove the actuator from the mounting adaptor.

Assembly:

- Locate the actuator on the mounting adaptor. Secure with the retaining clamp (see Figure 5).
- Torque load the clamping bolts to 6 N m (4.5 lbf ft).
- Position the 24 mm A/F nut over the stem and position the thrust washer into the stem undercut.
- Manually turn the actuator handwheel clockwise until the pressure cylinder abuts the stem.
- Fit the 24 mm A/F nut to the threaded connection of the pressure cylinder.
- Manually turn the actuator handwheel anticlockwise until the manual indicator tab retracts.
- If necessary refer to Section 8 for stroke adjustment.

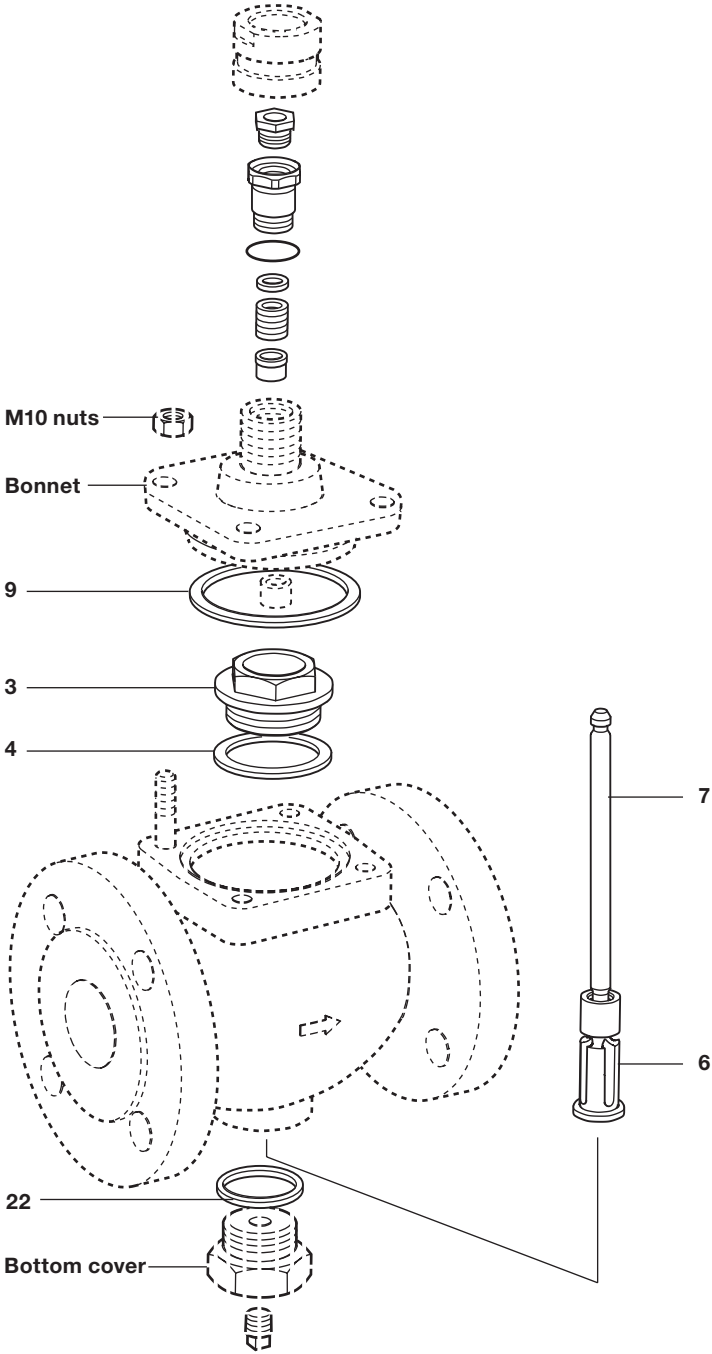


Fig. 9

10. Spare parts

The spare parts are available as indicated below. No other parts are available as spares.

Available spares

Gasket and packing set		Stock No. 4034880	**9, 13, 40, 41, 42, 43, 44**
Valve plug, seat and stem set		Stock No. 4034881	**3, 4, 6, 7, 8, 22**
Actuator with limit switch assembly (see Figure 8)	230 V	Stock No. 4034467	**26**
	24 V (UL)	Stock No. 4034468	**26**
Actuator limit switch assembly (see Figure 8)		Stock No. 4034419	**27**

How to order spares

Always order spares by using the description given in the Table above and state the size and flange type of the blowdown control valve.

Example: 1 - Gasket and packing set Stock No. 4034880, for Spirax Sarco DN40 BCV30 blowdown control valve flanged EN 1092 PN40.

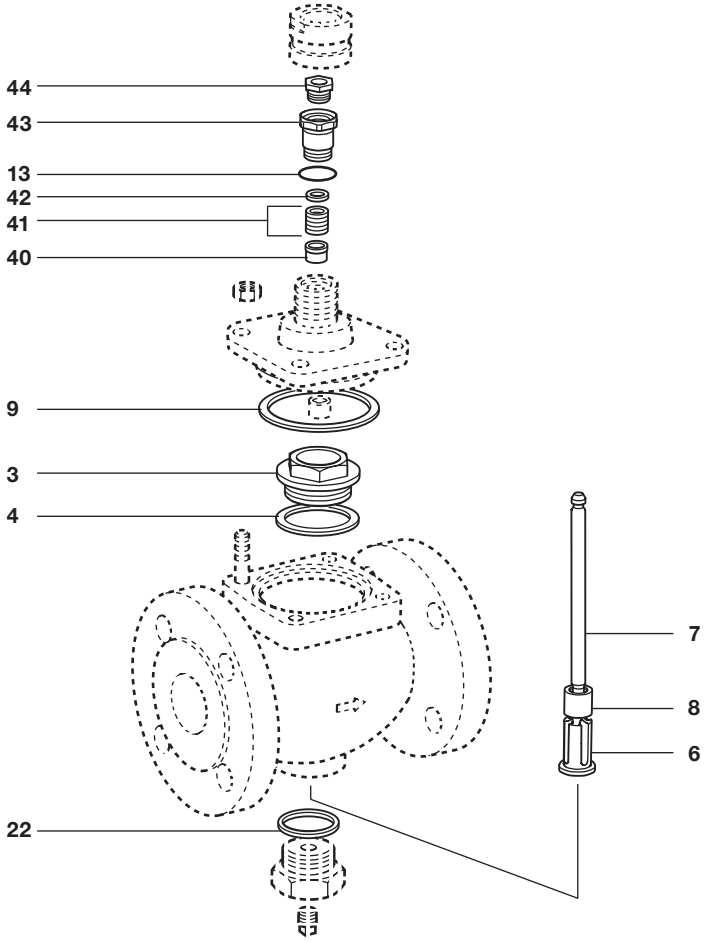


Fig. 10