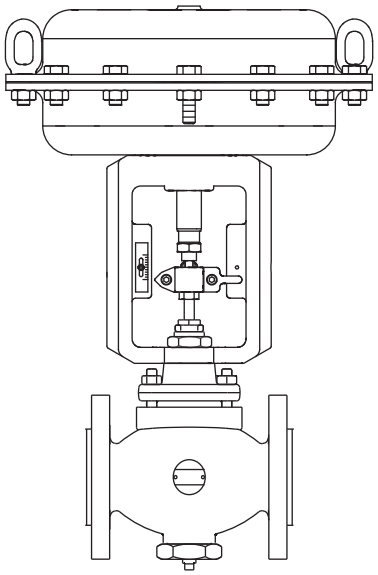
IM-P403-71
AB Issue 5

spirax sarco

BCV31
DN40 - Blowdown Control Valve
Installation and Maintenance Instructions



spirax sarco

1. Safety information

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

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 product listed below complies with the requirements of the European Pressure Equipment Directive 97/23/EC and carries the CE mark when so required. The product falls within the following Pressure Equipment Directive categories:

Product		Group 1 Gases	Group 2 Gases	Group 1 Liquids	Group 2 Liquids
BCV31	DN40	-	1	-	SEP

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

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

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

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

v) Remove protection covers from all connections 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 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 BCV31 is a pneumatically actuated control valve for the blowdown of steam boilers. It is normally used with a controller as part of an automatic TDS control system, though it can also be used for other high pressure drop flowrate applications.

3. Technical data

Valve maximum pressure	32 bar g	(464 psi g)
Valve maximum temperature	239°C	(462°C)
Actuator ambient temperature	110°C	(230°F)
Minimum air pressure	3 bar g	(44 psi g)
Maximum air pressure	6 bar g	(87 psi g)
Air consumption (20 mm travel)	1.60 litres (normal)	(0.565 ft^3 normal)
Air supply connection	¼" NPT	

4. Operation

The valve is spring loaded to the closed position (spring retract), and is also held closed by the boiler pressure. The valve is supplied with a flowrate 10 mm (0.4") stroke, but can be adjusted for higher or lower flowrates if required.
The actuator has a rolling diaphragm and a stroke indicator on the spindle.

Caution

Do not pressurise the spring side of the actuator housing.
Do not restrict the housing plastic vent cap.

The BCV31 will operate at any pressure between 3 - 6 bar g (46 - 87 psi g).
A regulated supply of filtered air is required, which should be free of oil and water. A suitable filter/regulator is the Spirax-Monnier MP2, fitted with a spring to provide a pressure range of 3 - 6 bar g (44 - 87 psi g). A solenoid valve is also required. See separate literature for regulator details. The BCV31 may be mounted horizontally or vertically.
For boiler blowdown applications the ideal take-off point for the blowdown is from a boiler side connection (Figure 1), 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 2. 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.
Spirax Sarco recommend and can supply a sample cooler and conductivity meter.
Fit a stop valve between the boiler and the BCV31. A check valve is recommended downstream of the BCV31.
In accordance with UK regulations and guidance notes, for **single boiler installations** the blowdown may discharge into the main blowdown line downstream of the bottom blowdown valve.
For **multi-boiler installations** the automatic blowdown lines must be separate from the main bottom blowdown line.
For further information see UK Health and Safety Executive Guidance Note PM60.
Regulations or guidance notes for other countries may differ.

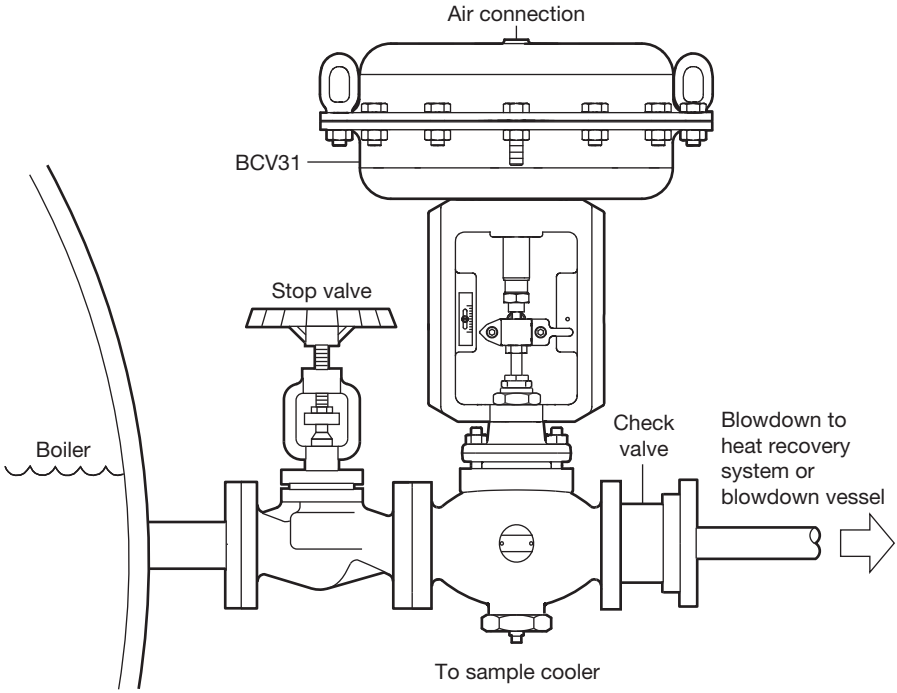


Fig. 1 Installation on a boiler side connection

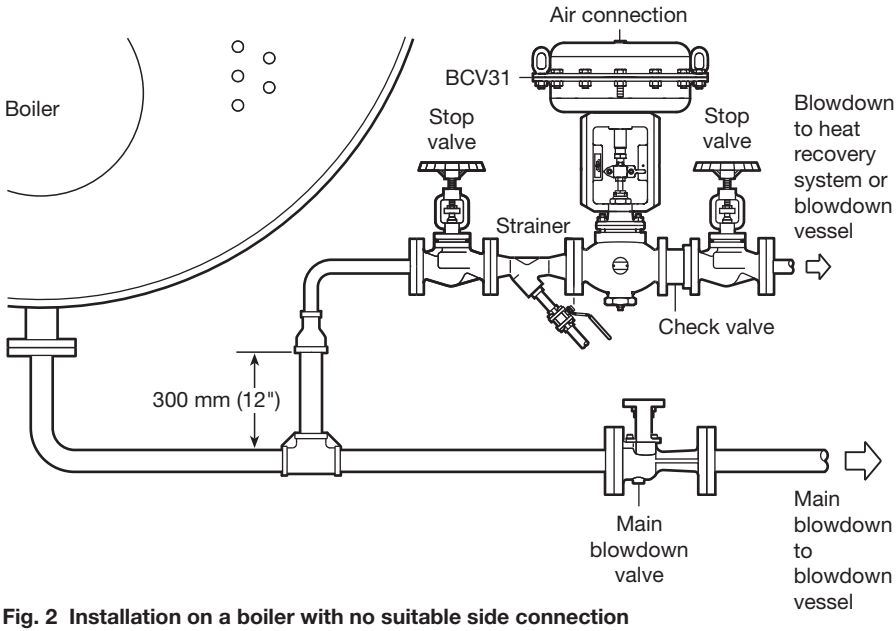


Fig. 2 Installation on a boiler with no suitable side connection

6. Flow settings

The valve is supplied with a low flowrate setting of 10 mm (⅜") stroke.

To increase the stroke to 15mm (⅝") or 20 mm (¾"):

- Isolate the valve from the boiler pressure and energise the solenoid valve so that the air supply can be manually controlled by the regulator.
- Apply just enough air pressure to open the valve fully (Figure 3).

Fig. 3

- Remove the clamp nuts and screws (**26** and **27**), and the clamp front and rear (**13** and **14**).
- Turn off the air supply and allow the actuator to retract fully (Figure 4).

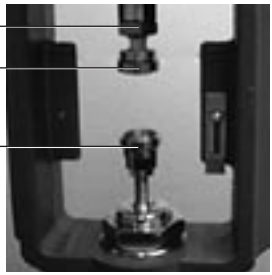


Fig. 4

- Loosen the actuator lock-nut (**25**), and screw the connector (**10**) fully into the spindle.
- Loosen the nut locking the valve stem to the adaptor (**11**).
- Position the adaptor so that only 8 mm of the valve stem thread is engaged (Figures **5** and **6**).

Fig. 5
Correct - 8 mm thread engagement

Caution
The valve stem must not protrude beyond the surface of the adaptor, otherwise the clamp will not fit corectly and may be damaged (see Figure 6).

Fig. 6
Incorrect - thread protruding above the adaptor

- Pull the valve stem upwards to fully close the valve.
- Measuring from the top of the stuffing box, mark the new stroke required on the valve stem - 15 mm or 20 mm (Figure 7).

Fig. 7

- Push the valve stem down so that the mark lines up with the stuffing box (Figure 8).

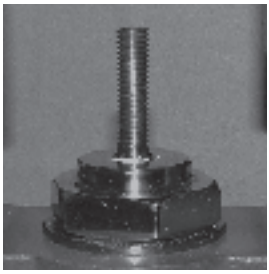


Fig. 8

- Apply air pressure to allow the actuator to descend fully.
- Unscrew the actuator connector until it just contacts the valve stem adaptor without opening the valve (Figure 9).
- Tighten adaptor and actuator lock-nuts.
- Refit the clamp, and its nuts and screws.

Fig. 9

Please note:
It may be necessary to make final adjustments to the actuator connector and the valve adaptor to ensure the clamp anti-rotation lugs engage with the yoke, and that the pointer is still on the scale.

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)	2900	(6380)	3450	(7590)	3550	(7810)
7.0	**102.0**	475	(1045)	3300	(7260)	4100	(9020)	4500	(9900)
10.0	**145.0**	500	(1100)	3700	(8140)	4750	(10450)	5450	(11990)
15.0	**218.0**	550	(1210)	4550	(10010)	6450	(14190)	7150	(15730)
20.0	**290.0**	800	(1760)	5750	(12650)	8100	(17820)	8650	(19030)
32.0	**464.0**	1300	(2860)	8400	(18480)	10300	(22660)	11050	(24310)

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

7. Maintenance

We recommend that the valve and actuator are examined annually and parts replaced as necessary.
Full actuator spares fitting instructions are given in the Installation and Maintenance Instructions for PN type actuators.
No routine maintenance is required.
The valve stem is sealed by packing rings, which can be adjusted if any leakage should occur at the valve stem (see Section 7.2).

7.1 Components

No.	Description
1	Yoke
2	Upper diaphragm housing
3	Diaphragm plate
4	Diaphragm
5	Spring
6	Spindle
7	Washer
8	Spacer
9	'O' ring
10	Connector
11	Adaptor
12	Collar
13	Clamp front
14	Clamp rear
15	Scale
16	Vent plug (not shown)

No.	Description
17	Bearing
18	Seal
19	Pan head screw
20	Nyloc nut
21	Bolt
22	Hex. head screw (short)
23	Hex. head screw (long)
24	Nut
25	Lock-nut
26	Socket head screw
27	Nut
28	Washer
29	Screw
30	Gasket
31	Lower diaphragm housing
32	Lifting eye

7.2 To adjust the valve stem seal:

- Turn the adjustable gland nut (**44, Figure 11**) clockwise one flat (60°) at a time, then operate the valve several times. Repeat if still leaking.

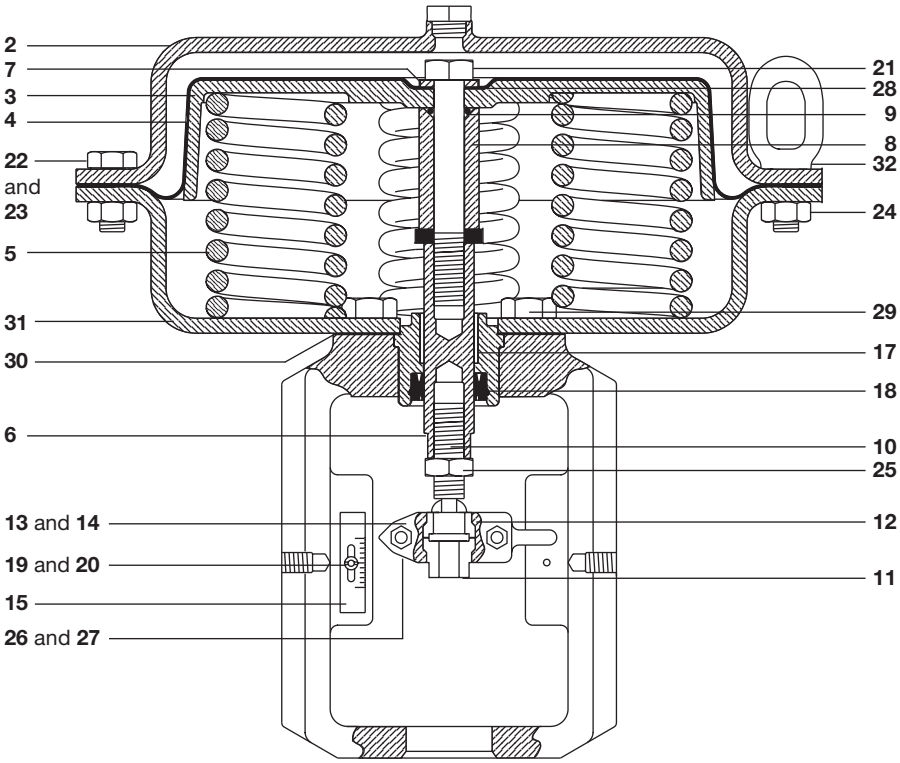


Fig. 10 PN9000R (spring-retract)

7.3 To replace the adjustable packing ring set:

- Remove the actuator.
- Remove and discard the five existing adjustable packing rings (**41**).
- Ensure the valve stem (**7**) and bonnet (**2**) are clean.

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

- Fit the bottom support ring (**40**) over the valve stem (**7**) and locate in the valve bonnet (**2**) 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 (**43**) into the valve bonnet (**2**) 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 (**7**) up and down over its full travel five or six times to bed in the packing rings.
- Tighten the gland nut (**44**) by two flats (**120**°).
- Reassemble the actuator, pressurise the system, and operate the valve five or six times.
- Adjust the gland nut (**44**) to stop any leaks (see Section 7.2).

7.3.2 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 support ring (**40**) over the valve stem (**7**) and locate in the valve bonnet (**2**) 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 (**7**).

  WARNING: Handle the gasket with care - it is fragile, and has a sharp reinforcement.
- Screw the stuffing box (**43**) into the valve bonnet (**2**) and torque to 25 - 30 N m (18 - 22 lbf ft).
- Move the valve stem (**7**) up and down over its full travel five or six times to bed in the packing rings.
- Tighten the gland nut (**44**) by two flats (**120**°).
- Reassemble the actuator, pressurise the system, and operate the valve five or six times.
- Adjust the gland nut (**44**) to stop any leaks (see Section 7.2).

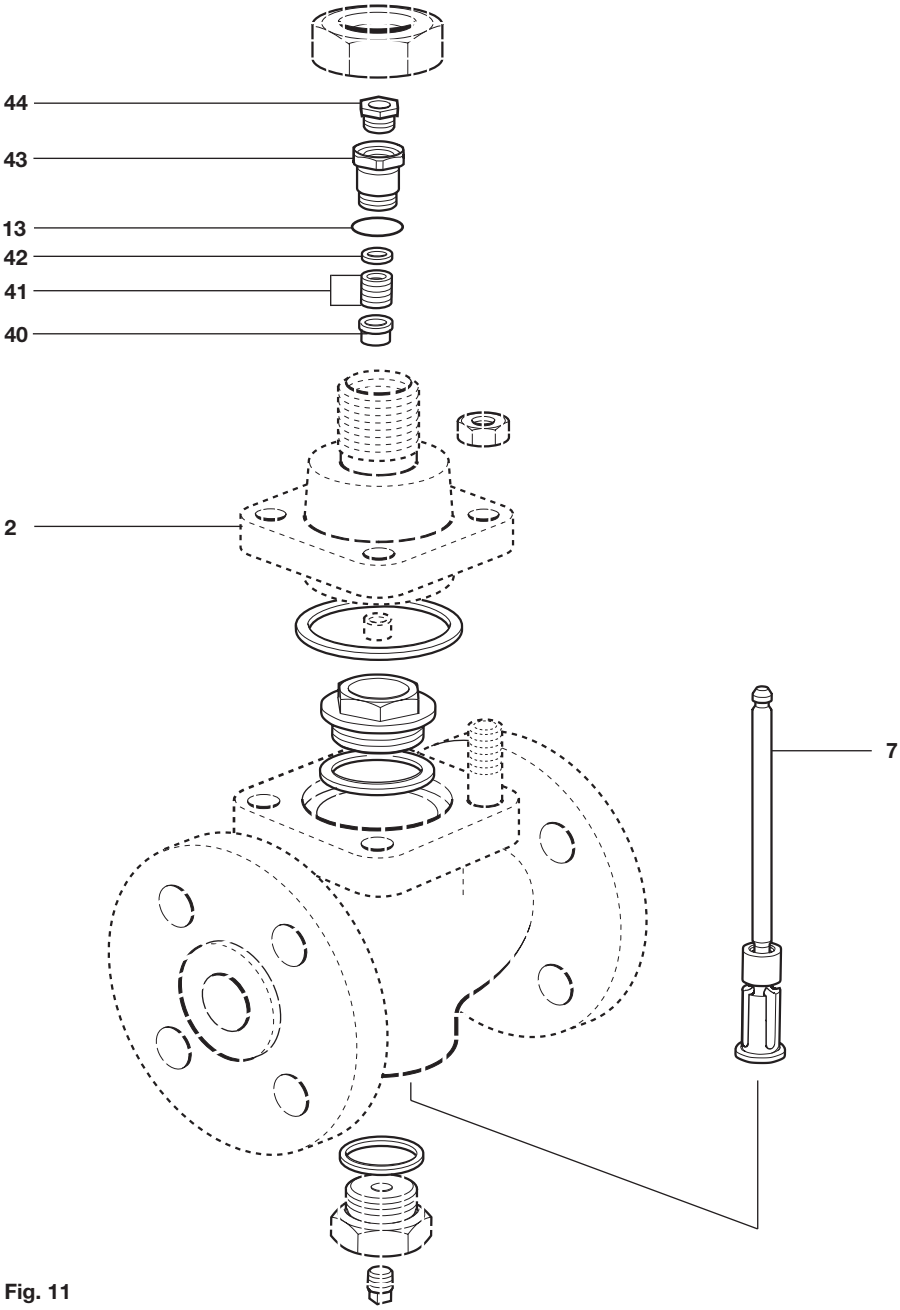


Fig. 11

7.4 To replace the valve plug, stem and seat

Removal:

- Isolate and depressurise the valve assembly.
- Unscrew and remove the M30 nut (**21**) and actuator.
- Unscrew and remove the bottom cover (**17**) and 'S' type gasket (**22**).
- Unscrew and remove the M10 nuts (**18**), bonnet (**2**) and gasket (**9**).
- Remove the valve stem (**7**) and plug assembly (**6**) from the valve body via the bottom cover port (**17**).
- Unscrew the valve seat (**3**) and remove the gasket (**4**).
- Ensure all the gasket sealing faces are clean and free from damage.

Assembly:

- Fit the new gasket (**4**) and the new valve seat (**3**). Torque load valve seat to 150 N m (110 lbf ft).
- Insert the new valve stem (**7**) and plug assembly (**6**) into the valve seat (**3**).
- Fit the new 'S' type gasket (**22**) and bottom cover (**17**). Torque load 150 N m (110 lbf ft).
- Fit the new bonnet gasket (**9**) and bonnet (**2**) over the valve stem (**7**). Secure with the M10 nuts (**18**) finger tight.
- Fit the actuator to the bonnet (**2**) and secure with the M30 nut (**21**) finger tight.
- Adjust the actuator as described in section 6. **Note:** Standard setting is 10mm stroke.
- Close the air supply to the actuator.
- Torque load the M10 bonnet nuts (**18**) to 50 N m (37 lbf ft).
- Torque load the M30 nut (**21**) to 50 N m (37 lbf ft).
- Tighten the M8 locking nut (**14**) against the stem adaptor (**27**).
- If necessary, refer to Section 6 for stroke adjustment.

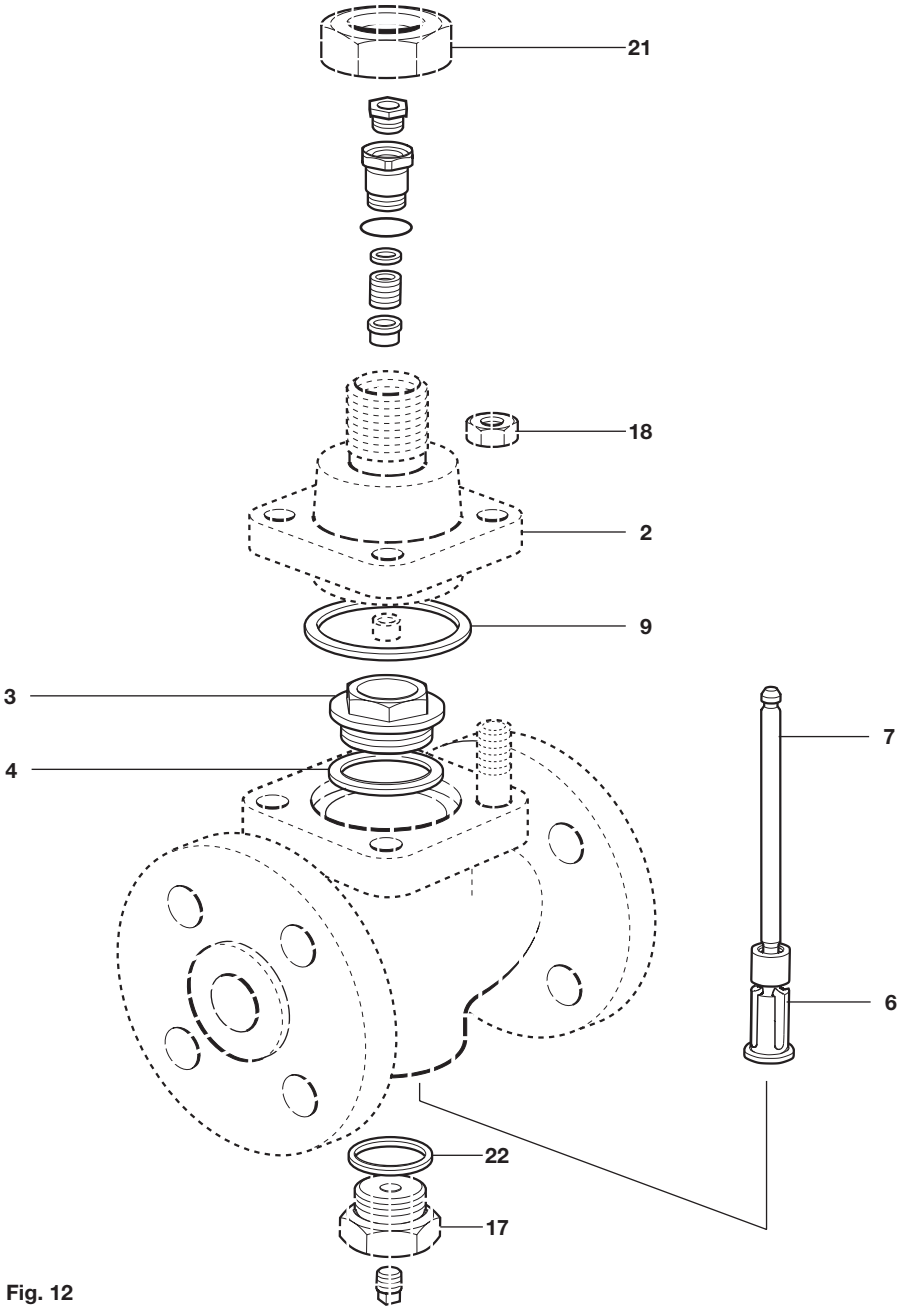


Fig. 12

Valve

A gasket and packing set, and a valve cone and stem set are available.
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. 4034882	**3, 4, 6, 7, 8, 22**

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 valve.

Example: 1 - Gasket and packing set Stock No. 4034880, for Spirax Sarco DN40 BCV31 blowdown control valve flanged EN 1092 PN40.

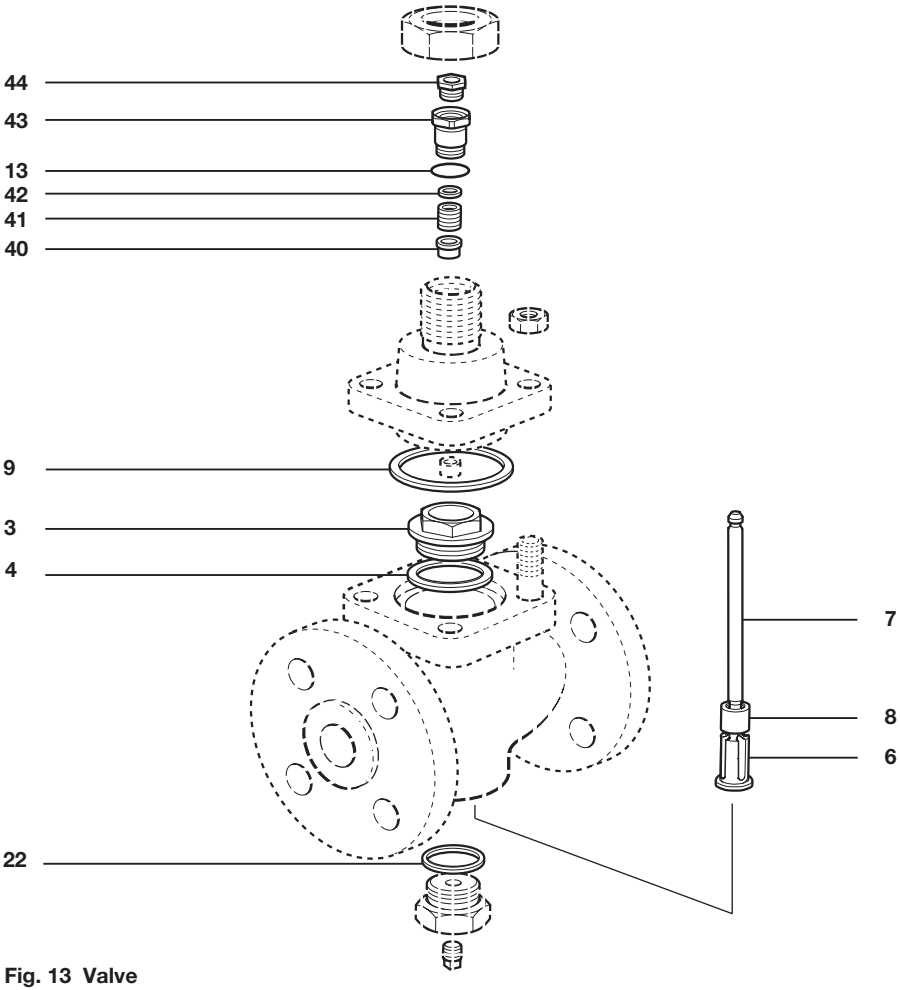


Fig. 13 Valve

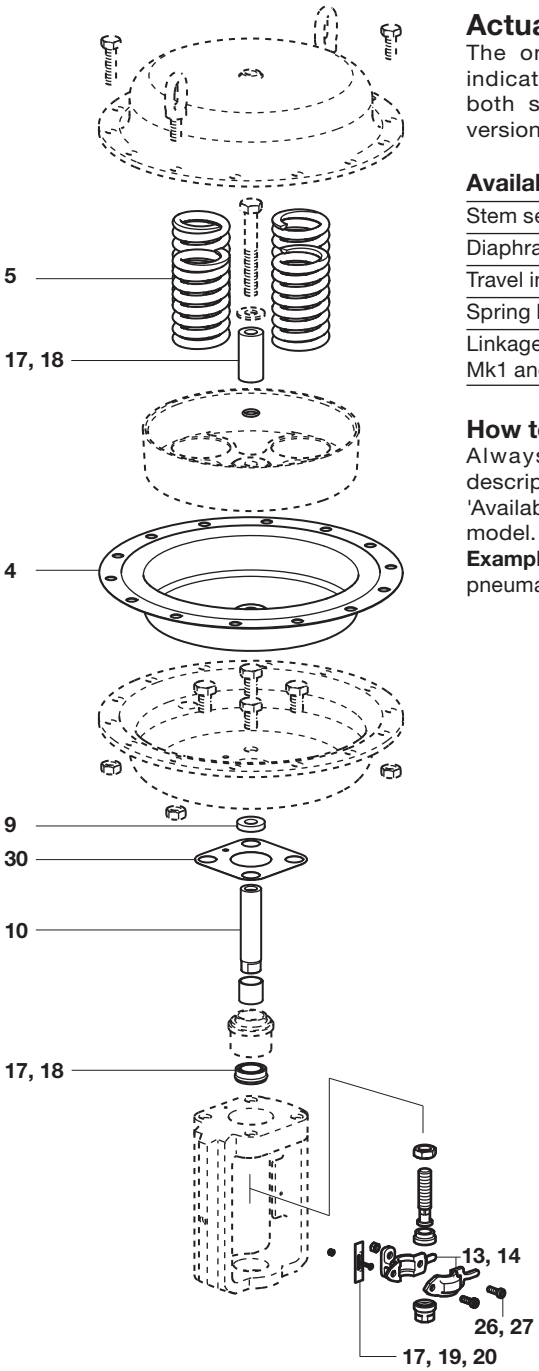


Fig. 14 Actuator

Actuator

The only spares available are clearly indicated below and are common for both spring-extend and spring-retract versions.

Available spares

Stem seal kit	**17, 18, 30**
Diaphragm kit	**4, 9**
Travel indicator kit	**15, 19, 20**
Spring kit	**5**
Linkage kit (suitable for Mk1 and Mk 2 valves)	**10, 13, 14, 26, 27**

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the actuator model.

Example: 1 - Stem seal kit for a PN9120 pneumatic actuator.