

OPERATING INSTRUCTIONS

Category IV Safety Accessory



Type
4000 Pilot Operated Relief Valve Snap Action 4010P

Application
Suitable for compressed Gas service.

Operation
The set pressure can be varied as required by compressing or relaxing the spring in the Pilot Block using the Adjusting Screw:

Clockwise turns compress the spring increasing the set pressure.
Anti-clockwise turns relax the spring decreasing the set pressure.

Lifting and Handling
Wooden cases should be lifted using either a Fork Lift Vehicle or a Crane with adequate Safety Approved slings applied to carry the weight, which will be evenly distributed within the case.

Important: All manual handling operations should be carried out in compliance with the Manual Handling Operations Regulations 1992 (SI 1992/2793) (EC Directive 90/269/EEC).

Storage
Valves with Screwed ends shall have plugs fitted in their connections to prevent ingress of dirt etc. Flanged, valves shall have their bores blanked off.

We recommend that plugs/blanks be removed immediately prior to installation.

General

1. When a new valve leaves Broady Flow Control, it has been manufactured and tested by trained and experienced personnel. When you remove a valve from your system and perform the maintenance tasks that are outlined herein, you will need proper training.

Do **not** attempt to accomplish these tasks without adequate training and understanding of the valve operation.

2. Any and all stated or implied warranties that are in effect during the purchase of a new Broady valve are null and void once the valve has been disassembled by someone other than approved Broady personnel.

3. The contents of this document are subject to change without notice.

Safety Warning!
Discharge from outlet may be violent and must not be allowed to create a hazard to persons or property.

Testing

It is recommended that the following tests be carried out before installation of the valve: seat tightness and set pressure.

Test Equipment
Connect valve inlet to a pressure vessel in which pressure may be raised gradually and measured by means of a precision pressure gauge.

Set Pressure Test
Check that valve starts opening at required set pressure (refer to Valve Nameplate for correct value).

Changes outside the stated tolerances must be corrected by varying the spring compression using the Adjusting Screw (12). Fig 4

- To regulate the set pressure: **(See Fig 4 Pilot Block)**
- Fit valve to test rig with no pressure on valve inlet
 - Remove the Locking Cover (18). DO NOT turn Top Seat Sleeve (2)
 - Accurately measure the distance 'X' of the Top Seat Sleeve (12) (See Fig 4)
 - Remove Locknut (19) fitted to Adjusting Screw (12)
 - Adjust using Adjusting Screw (12) until the desired set pressure is achieved. This is determined by a Pops action
 - Refit and tighten Locknut (19)
 - Check Distance 'X' of the Top Seat Sleeve
 - Refit and tighten Locking Cover (18)

Note: For each successive set pressure check; Locknut (19) must be tightened.

Seat Tightness Test
After the set point lift test, test the valve for seat tightness
The valve outlet should be fitted with an appropriately sized leakage detector (see Fig. 1) in accordance with API 527.

Raise inlet pressure to 90% of set pressure and check seat tightness for nil leakage

Should the valve show signs of leakage, refer to table "Faults in Operation" (Fig. 2).

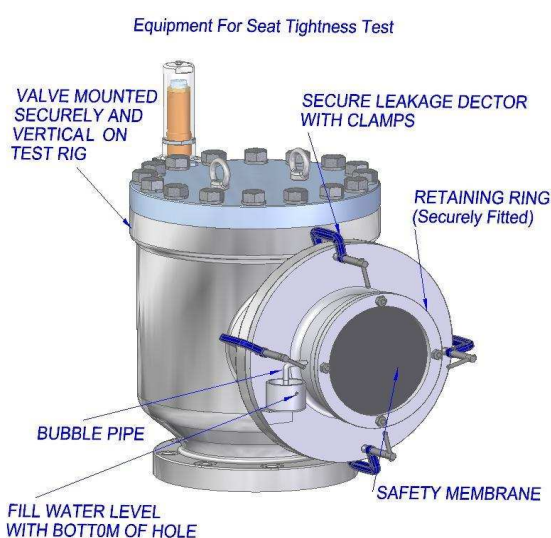


Fig 1 API 527 Compliant Leakage Detector

Installation and Commissioning
It is most important that the pipeline and valve connections be clean and free from dirt, scale, etc.

Avoid bumping or shaking valve to prevent misalignment of trim and damage to flange faces.

Fit valve in pipeline with inlet flange down and Adjusting Screw (13) in vertical position above pipeline.

It is also advisable to fit a stop valve on high-pressure side of line. The stop valve should be of full bore type so as not to restrict the flow. Use inlet and outlet pipework as short as possible and of dimensions equal to the valve connections.

Uniformly tighten fasteners securing valve connections to pipework. Secure outlet pipework in order to reduce vibration and avoid strain on the outlet.

Avoid elbows with small curvature radii on the outlet pipe: for high temperature gas and vapour discharge, use expansion joints. After valve has been installed, make it pop at least twice to allow automatic alignment of trim.

Maintenance

Regular Checks:
Check at regular intervals for signs of obvious faults.
Leakages must be repaired immediately, especially when the medium is poisonous, highly volatile or explosive.

Examine annually for signs of defect, damage or deterioration. Give special attention to contact/seating faces. If damaged, these must be re-machined.

Springs should be replaced if there is any sign of deterioration.

All parts should move freely in their respective guides.

Note: Quote the unique valve serial number when ordering spare parts.

Safety Warning!
Before dismantling, ensure that the valve has been isolated from the pressure.

Dismantling and Reassembly Main Valve (Fig 3)

- Dismantling: Note:- Small Loose Parts in Valve**
- Unscrew nut on the compression fittings (39 or 12) and remove Pipe (13)
 - Remove 4 off Cap Screws (10) and lift off pilot block assembly.
 - Remove O-Rings (23 & 24), Plugs (22) Shuttle Valve Seat (21), Shuttle Valve (20).
 - Remove Cover Bolts and Washers (11 & 29), lift off Cover (2).
 - Remove Spring (57) if fitted and O-Ring (17)
 - Lift out Piston Lid and Piston Liner (6 & 5) from Body, remove Piston Lid (6) from Piston Liner (5)
 - Remove O-Ring (15) and Guide Rings (16) from Piston Lid (6)
 - Unscrew Counter Sink Screw(s) (18), remove O-Ring Retainer (14) and O-Ring (9) from Piston Lid (6).
 - Unscrew and remove Seat Retainer (8), lift out Seat (7) and O-ring (19)
 - Unscrew and remove Site Test Connector Assembly (37), Pick-Up Pipe Connector (36), Pick-Up Pipe (4) and O-Ring (30).

Reassembly:
Carry out the operations listed for disassembly in reverse, taking care to avoid damage to the seating surfaces and O-Ring seals
Clean the trim thoroughly throughout. Lubricate Adjusting Screw, Spring Carrier with graphite grease or similar

Danger of Explosion!
Oxygen Service - Carefully degrease all components before assembling valves. Failure to do so could result in an explosion.

Dismantling and Reassembly Pilot Block (Fig 4)

Dismantling: Note:- Small Loose Parts in Valve

- Remove the Locking Cover (18). DO NOT turn Top Seat Sleeve (2)
- Accurately measure the distance 'X' of the Top Seat Sleeve (2) (See Fig 4)
- Unscrew Locknut (19) fitted to Adjusting Screw (12), unscrew and remove Adjusting Screw (12). Spring Carrier Upper (10), Spring (9) and Spring Carrier Lower (11).
- Unscrew and remove Top Seat Sleeve (2), unscrew and remove Seat Retainer (13) from inside Spring Housing of the Seat Top Sleeve (2), push out Top Seat Plunger (22), Inverted Insert Outer Ring (20), Inverted Insert (21), O-Ring's (16 & 17)
- Lift out Pin (8)
- Unscrew and remove Inlet Sleeve (3) from Body (1) and remove O-Ring (15)
- Unscrew and remove Lower Nozzle Seat (13), lift out Blowdown Piston (5), Upper Seat Insert (6) and O-Ring (7) from Inlet Nozzle (3)

Reassembly:
Carry out the operations listed for disassembly in reverse, taking care to avoid damage to the seating surfaces and O-Ring seals.

Clean the trim thoroughly throughout. Lightly Lubricate Adjusting Screw, Spring Carrier with a graphite grease or similar

Set the Top Seat Sleeve (2) to the measurement 'X' recorded earlier.

Dismantling and Reassembly Site Test Connector (Fig 5)

Dismantling: Note:- Small Loose Parts in Valve

- Remove Locking Pin (7)
- Unscrew Seat (2)
- Lift out Lid (3) and remove O-Rings (4 & 5)

Reassembly:
Carry out the operations listed for disassembly in reverse, taking care to avoid damage to the seating surfaces and O-Ring seals

Clean the trim thoroughly throughout.

Fig 4 Pilot Block

| Item | Description | Qty |
|-------|-----------------------------------|-----|
| 1 | Body | 1 |
| 2 | Top Seat Sleeve | 1 |
| 3 | Inlet Nozzle | 1 |
| 4 | Lower Nozzle Seat | 1 |
| 5 | Blowdon Piston | 1 |
| 6 | Upper Seat Insert | 1 |
| * 7 | O-Ring | 1 |
| 8 | Pin | 1 |
| 10 | Spring Carrier Upper | 1 |
| 11 | Spring Carrier Lower | 1 |
| 12 | Adjusting Screw | 1 |
| 13 | Seat Retainer | 1 |
| * 14 | O-Ring | 1 |
| * 14B | Back-Up Ring for 900 to 2500 ANSI | 1 |
| * 15 | O-Ring | 1 |
| * 15B | Back-Up Ring for 900 to 2500 ANSI | 1 |
| * 16 | O-Ring | 1 |
| * 16B | Back-Up Ring for 900 to 2500 ANSI | 1 |
| * 17 | O-Ring | 1 |
| 18 | Locking Cover | 1 |
| 19 | Locknut | 1 |
| 20 | Inverted Insert Outer Ring | 1 |
| 21 | Inverted Insert | 1 |
| 22 | Top Seat Plunger | 1 |
| 24 | Spindle | 1 |
| * 25 | Joint | 1 |
| 26 | Plug | 1 |
| 27 | Gag Screw | 1 |

- * Recommended Spare Parts. All Flange rating
- * Additional spares for flange ratings 900 to 2500 ANSI

Fig 5 Site Test Connector

| Item | Description | Qty |
|------|---------------|-----|
| 1 | Body | 1 |
| 2 | Seat Adaptor | 1 |
| 3 | Lid | 1 |
| * 4 | O-Ring | 1 |
| * 5 | O-Ring | 1 |
| 6 | Blanking Plug | 1 |
| * 7 | Spring Pin | 1 |

- * Recommended Spare Parts. All Flange rating

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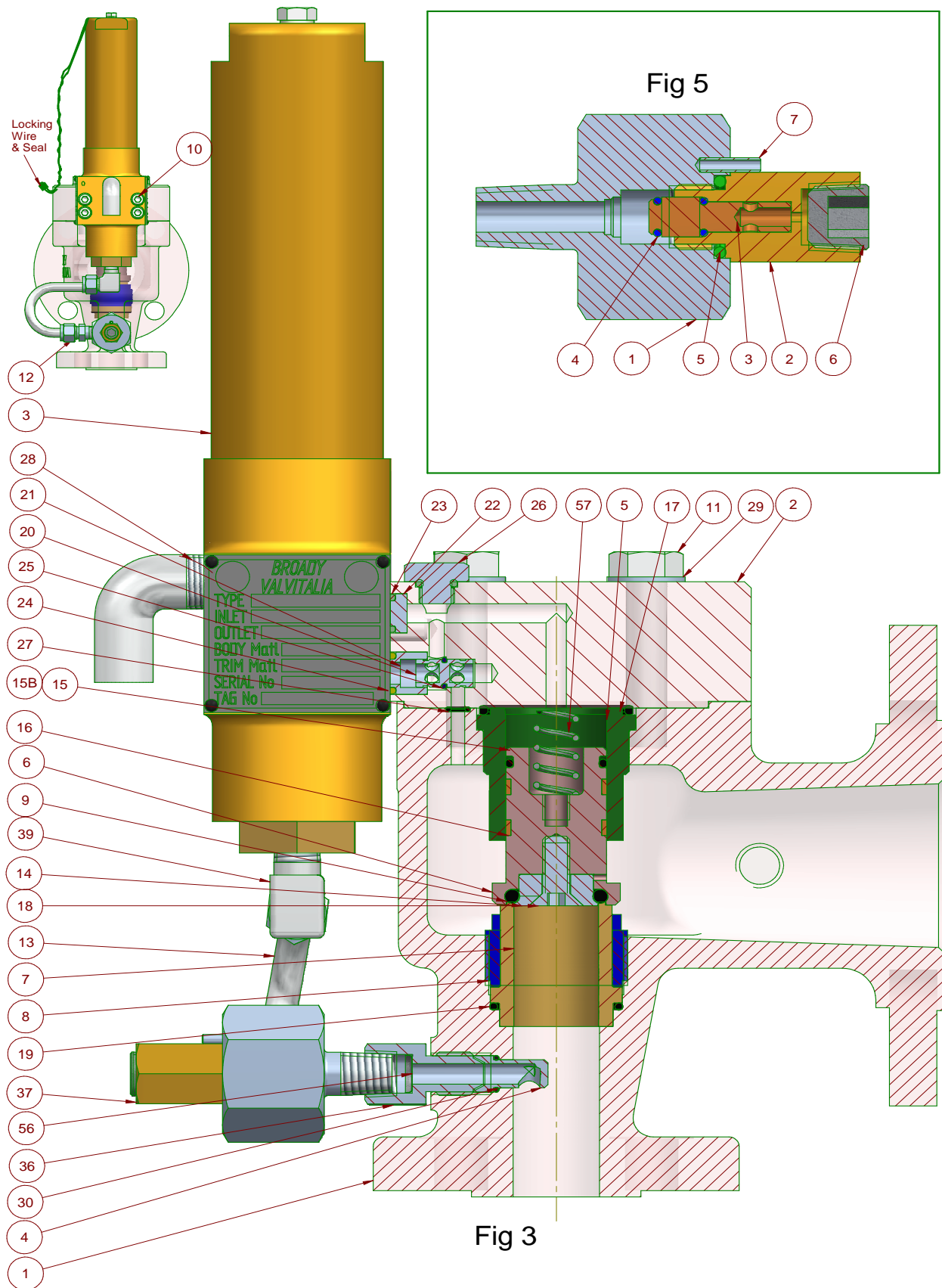


Fig 3

Fig 2 - Faults in Operation

| FAULT | CAUSES | SOLUTIONS |
|---------------------------------|--|--|
| Leakage | (1) Presence of foreign matter between seat and disc (2) Scratching or pitting on seat surface (3) Valve not mounted vertically (4) Seat O-Ring damaged | (1) Discharge valve once or twice consecutively. Should leakage continue, disassemble valve and clean trim (2) Disassemble valve, grind and lap Seat (3) Correct installation (4) Seat Replace O-Ring |
| Discharge at Incorrect Pressure | (1) Loosening of Lock Nut on Spring Adjusting Screw. (19) (4) Poor trim alignment | (1) Tighten Lock Nut after re-calibrating the valve (4) Discharge the valve 2 or 3 times to allow self-alignment of the trim |
| | | |

Fig 3 Pilot Main Body Assembly

| Item | Description | Qty |
|-------|-----------------------------------|---------|
| 1 | Body | 1 |
| 2 | Cover | 1 |
| 3 | Snap Action Pilot | 1 |
| 4 | Pick-Up Pipe | 1 |
| 5 | Piston Liner | 1 |
| 6 | Piston Lid | 1 |
| 7 | Seat | 1 |
| 8 | Seat Retainer | 1 |
| ✘ 9 | O-Ring | 1 |
| 10 | Socket Head Capscrew | 4 |
| 11 | Bolts | Various |
| 12 | Compression Fitting | 1 |
| 13 | Pipe | 1 |
| 14 | O-Ring Retainer | 1 |
| ✘ 15 | O-Ring | 1 |
| ✘ 15B | Back Up Ring for 900 to 2500 ANSI | 1 |
| ✘ 16 | Guide Ring | 2 |
| ✘ 17 | O-Ring | 1 |
| 18 | Counter Sink Screw | 1 |
| ✘ 19 | O-Ring | 1 |
| 20 | Shuttle Valve | 1 |
| 21 | Shuttle Valve Seat | 1 |
| 22 | Blanking Plug | 2 |
| ✘ 23 | O-Ring | 3 |
| ✘ 24 | O-Ring | 1 |
| ✘ 25 | O-Ring | 1 |
| 26 | Plug | 1 |
| ✘ 27 | O-Ring | 1 |
| 28 | Exhaust | 1 |
| 29 | Spring Washer | Various |
| ✘ 30 | O-Ring | 1 |
| ✘ 31 | O-Ring | 1 |
| 36 | Pick-Up Pipe Connector | 1 |
| 37 | Site Test Connector | 1 |
| 39 | 90° Compression Fitting | 1 |
| 56 | Filter | 1 |
| 57 | Spring | 1 |

✘ Recommended Spare Parts. All Flange rating

✘ Additional spares for flange ratings 900 to 2500 ANSI

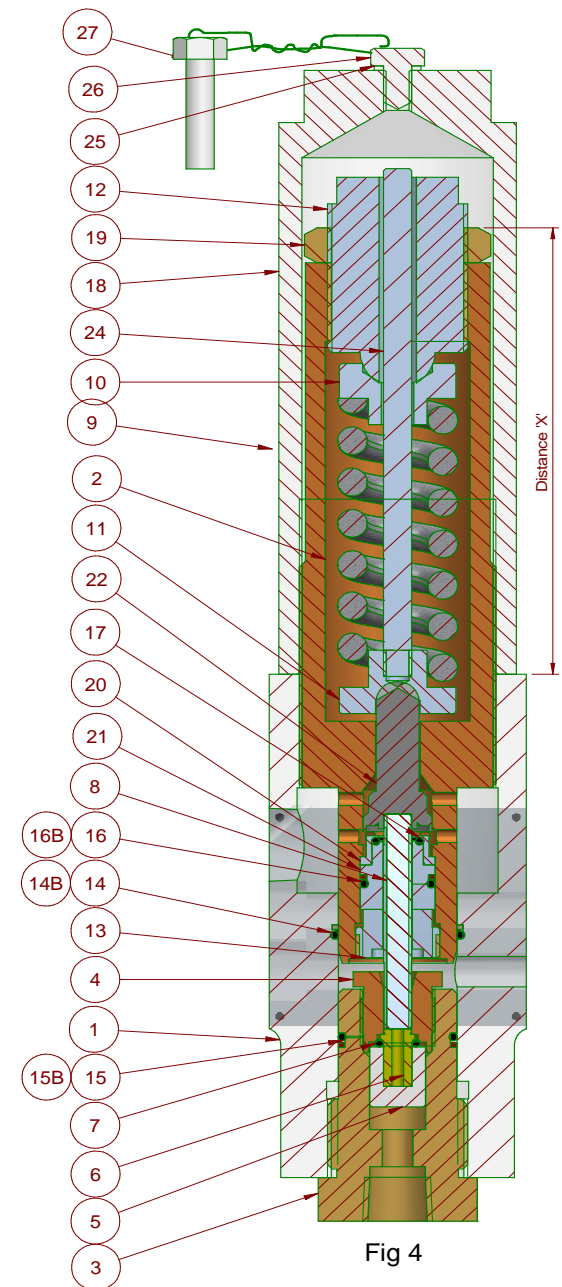


Fig 4