

OPERATING INSTRUCTIONS

Category IV Safety Accessory



Type
4000 Pilot Operated Relief Valve Modulating Action
Type 4010M&4020M

Application
Suitable for compressed Gas & Liquid 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 (13). Fig 4

To regulate the set pressure: **See Fig 4 Pilot Block**

1. Fit valve to Test Rig with no pressure on valve inlet.
2. Remove the locking cover (18)
3. Adjust using Adjusting Screw (13) until the desired set pressure is achieved.
4. Refit & tighten Lock Cover (18)

Note: For each successive set pressure check; Locking cover (18) 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)

Equipment For Seat Tightness Test

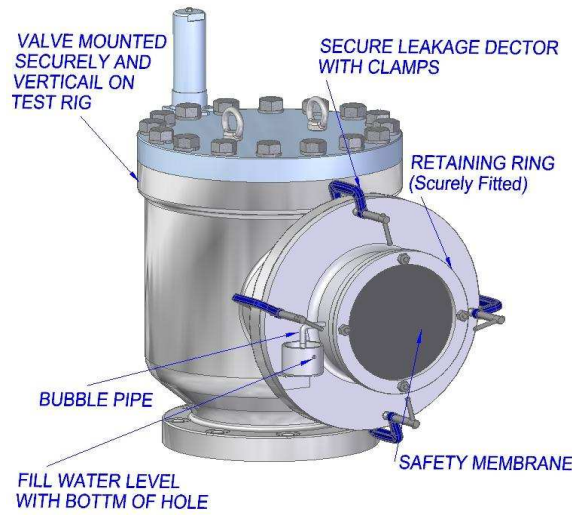


Fig 1 API 527 Compliant Leakage Detector



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 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. To pop the valve increase the line pressure to 110% of the set pressure



Maintenance

Regular Checks:
Check at quarter yearly 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
1. Unscrew nut on the compression fittings(39or12)and remove pipe (13)

2. Remove Cap Screws (10 & 33) and lift of pilot block assembly.
3. Remove O-Rings (31), Unscrew Capscrews (28) & lift off Pilot Block Spacer (32)
4. Remove O-rings (23)(24), Plugs (22) Shuttle valve seat (21), Shuttle Valve (20).
5. Remove Cover bolts & washers (11 & 29), lift off Cover (2).
6. Remove Spring (57) if fitted & O-Ring (17)
7. Lift out Piston lid & Liner (6 & 5) from Body, remove Piston lid (6) from Piston liner (5)
8. Remove O-Ring (15) & Guide Rings (16) from Piston Lid (6)
9. Unscrew Counter sink screw(s) (18), remove O-Ring Retainer (14) & O-Ring (9) from Piston Lid (6).
9. Unscrew & remove Seat retainer (8), lift out Seat (7) & O-ring (19)
10. Unscrew & remove Site test connector assembly (37), Pick up pipe connector (36),Pick up pipe (4) & O-ring (30).

Reassembly:
Carry out the operations listed for disassembly in reverse, taking care to avoid damage to the seating surfaces & 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

1. Unscrew & Remove Locking Cover (18)
2. Unscrew 4 off Cap Screws (11) and lift off Cover/Spring Housing(2)
3. Lift off Upper Spring Carrier (17) & Spring (16)
4. With a spanners hold the top of the internal distance piece(28) on the two flats & unscrew Nyloc nit (30), lift off Spring Plate (33), Diaphragm Sleeve (32), Spring Carrier/Piston(30) & Diaphragm(29)
5. Lift off Distance Piece (3)
6. With a spanner hold the top of the Internal distance piece(28) on the two flats and a spanner on the hexagon of the feed back piston(10) unscrew the internal distance piece(28) & Slide out the Feed back piston (10) from Distance piece (3). Remove O-ring (22) & 25
7. Hold the Feed back piston(10) with spanner & unscrew Inlet seat (4) Remove spring (23) & O-ring (26)
8. With a screw driver in the slot on the end of the Inner spool (5) using a spanner, unscrew and remove the Spool upper seat collar(8) & O-ring (7)
9. Slide out Inner Spool(5) from Spool sleeve (6) & Inner seat (4) and remove O-rings (20, 7, & 27,)
10. Unscrew & remove Hex sleeve (9) from bodi(1) & remove O-rings (19)

Fig 4 Pilot Block

Item	Description	Qty
1	Body	1
2	Cover/Spring Housing	1
3	Distance Piece	1
4	Inlt Seat	1
5	Inner Spool	1
6	Spool Sleeve	1
✘	7 O-Ring	2
8	Spool Upp Seat Collar	1
9	Hex Sleeve	1
10	Feed Back Piston	1
11	Sock Head Cap Screw	4
13	Adjusting Screw	1
14	Nut , Nyloc	1
16	Spring	1
17	Spring	1
18	Locking Cover	1
✘	19 O-Ring	2
✘	20 O-Ring	1
✘	22 O-Ring	1
23	Loading Spring	1
✘	25 O-Ring	1
✘	26 O-Ring	1
✘	27 O-Ring	1
28	Internal Distance Piece	1
✘	29 Diaphragm	1
30	Spring Carrier/Piston	1
✘	32 Diaphragm Sleeve 4020M Only	1
33	Spring Plate 4020M Only	1

✘ Recommended spare parts.



Dismantling and Reassembly Site Test Connector See Fig 4

Dismantling: Note:- Small Loose Parts in Valve

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

Reassembly:

Carry out the operations listed for disassembly in reverse, taking care to avoid damage to the seating surfaces & O-ring seals

Clean the trim thoroughly throughout.

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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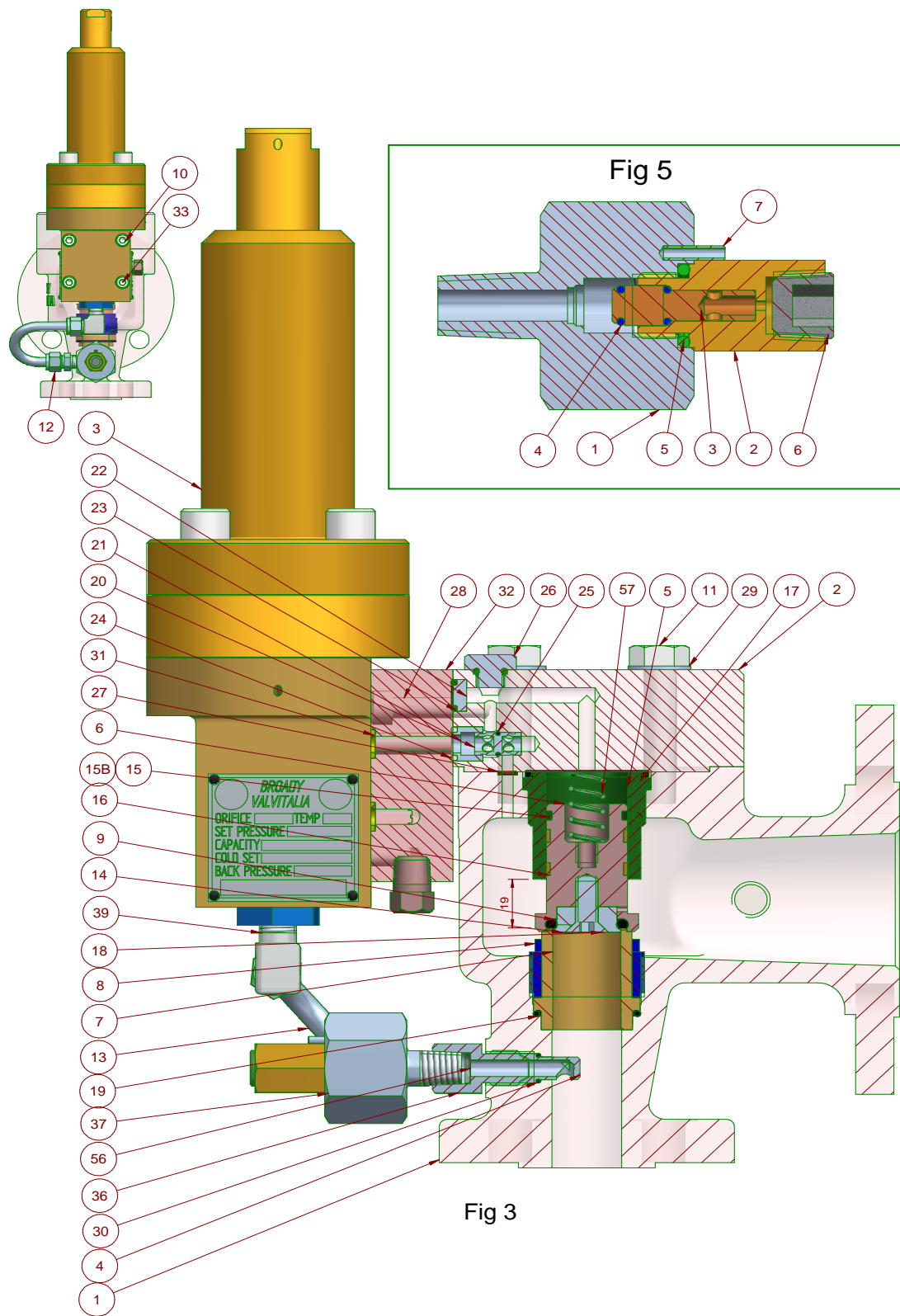


Fig 3

Fig 3 Pilot Pilot Main Body Assembly

Item	Description	Qty
1	Body	1
2	Cover	1
3	Modulating 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	Sock Head Capscrew	4
10	Sock Head Capscrew	2
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	Various
✘ 19	O-Ring	1
20	Shuttle Valve	1
21	Shuttle Valve Seat	1
22	Blanking Plug	1
✘ 23	O-Ring	3
✘ 24	O-Ring	1
✘ 25	O-Ring	1
26	Plug	1
✘ 27	O-Ring	1
28	Sock Head Capscrew	2
29	Spring Washer	Various
✘ 30	O-Ring	1
✘ 31	O-Ring	1
32	Pilot Block Spacer	1
33	Sock Head Capscrew	2
34	Plug	2
35	Modulating Plug	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.

Fig. 2 - Faults in Operation

FAULT	CAUSES	SOLUTIONS
Leakage	(1) Presence of foreign matter between seat and disc	(1) Discharge valve once or twice consecutively. Should leakage continue, disassemble valve and clean trim.
	(2) Scratching or pitting on seat surface	(2) Disassemble valve, grind and lap seat.
	(3) Valve used with a medium other than specified when ordering	(3) Lap seat and disc more finely if the valve originally ordered for liquid service is used with gas
	(4) Valve not mounted vertically.	(4) Correct installation.
	(5) Seat O-Ring damaged	(5) Seat Replace O-Ring
Discharge at incorrect pressure	(1) Loosening of lock nut on spring adjusting screw.	(1) Tighten lock nut after re-calibrating the valve.
	(4) Poor trim alignment.	(4) Discharge the valve 2 or 3 times to allow self-alignment of the trim.

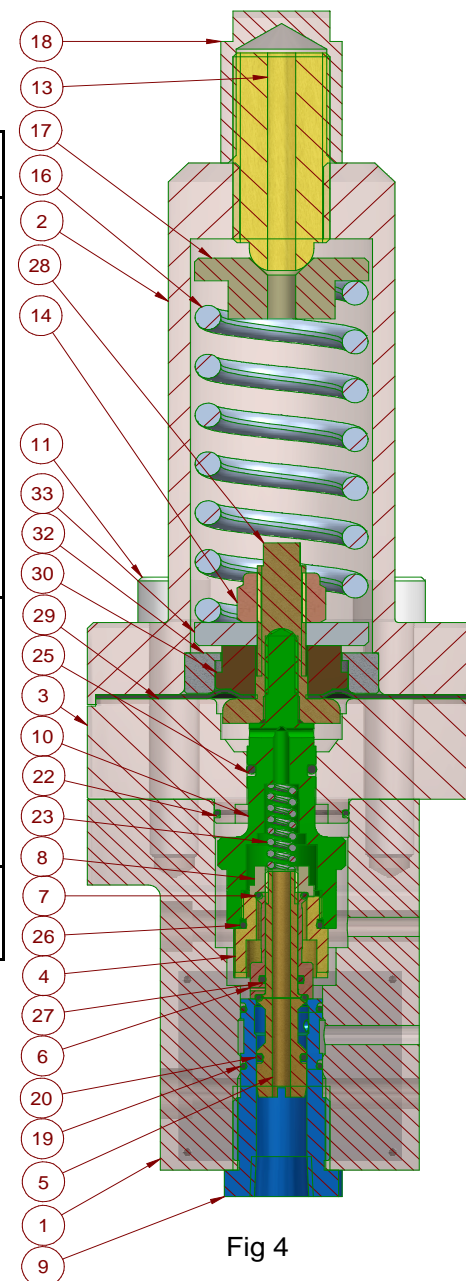


Fig 4