1.0 Foreword

Hindle Cockburns design considerations have centered on reliability and safety being of principle importance to all modern process industries. The valves conform fully to design requirements of API 6D, and fire safe to BS 6755 part 2, and are accepted by principle users and approval authorities. All components are produced to tight tolerances and some are specially treated to withstand demanding service conditions. The excellent design features of the range are complemented by the established quality assurance system, which is approved by major end users. Although it is possible to carry out on-site maintenance of this type of valve, it is recommended that the valves are serviced at:

Hindle Ball Valves are more reliable, more intrinsically safe and have a longer service life than is commonly found amongst top quality ball valves.

2.0 Main characteristics - (two & three-piece bodies)

All Supa-Seal trunnion mounted ball valves utilise a two or three piece body unit.

- **Sealing system**
  The resilient seat insert is mechanically retained within the seat ring and is sealed by an ‘o’ ring, eliminating the possibility of seat blow out and maintaining long term reliability. The seat insert incorporates a wiping action face profile to clean the surface of the ball during operation. At low operating pressure the seat rings are loaded forward by means of springs which are located away from the line of flow to prevent debris build up impairing their action.
  At higher line pressure the upstream seat becomes pressure energised against the ball to form a tight seal whilst the downstream seat remains spring loaded.
- **Firesafe seal**
  The spacer seal ring normally carries the spring load via the pressure plate. Fire may decompose the spacer ring, allowing the pressure plate to activate the steel backed graphite fire seal. The seat ring is loaded forward to seat metal to metal against the ball.
- **Cavity relief**
  Any tendency to increase the pressure in the body cavity due to fluid expansion will result in automatic relief of such pressure excess to the downstream side.
- **Block & bleed**
  The seat design renders the valve ideal for double block & bleed service. A body cavity bleed port is provided on all Supa-Seal valves and can be used to check the sealing performance of the seats.
- **Stem sealing**
  An ‘o’ ring system provides excellent stem sealing under normal operating conditions and is backed up in case of fire damage, by graphite seals loaded by a mechanically energised gland component. This gland design provides compensation for cold flow of the graphite seals and offers an emergency gland seal adjustment facility.
- **Anti-static**
  All Supa-Seal valves are fitted with anti-static devices to ensure electrical continuity between ball, stem and body.
- **Bearings**
  Bearings are of self-lubrication, PTFE coated type and are located away from the flow stream to minimise debris ingress, maintaining low operation torque and long service life.

3.0 Pre-commissioning

- **Operations**
  Pneumatically operated valves require only to be operated to ensure no undue stresses have created hindrance to ease of operation. Precise manufacture of associated components assures correct alignment of the bore in the ball.
- **Protection**
  Restore the paint work of any components which have been damaged in transportation and assembly.
4.0 Installation

4.1 Installation requirements

Access
Once on site the access requirement is to remove the valve completely from the line for maintenance.

Pre-installation
Ensure flange protectors on valve are removed and inspect internally to ensure the valve is free from foreign matter. Check the valve will operate and the position of the ball/bore alignment is correct. Ensure no external damage has occurred in transit.

Orientation
The valves referred to in this manual are bi-directional flow and therefore may be installed in the line either way round.

4.2 Installation procedure

Note: Ensure that the valve assembly is properly supported using adequate lifting hooks and cables where necessary.

1. Lift the valve into the installation, ensuring that the adjacent pipe flanges are aligned so that no pipe work stress is imposed upon the valve body. The valve should be lifted by the body and connector flanges, not by the actuator.

2. When the pipe work flanges are properly located, fit suitable gaskets to the flanges faces and assemble flange bolting.

3. Tighten flange bolts in a diagonal sequence to ensure even compression of the gasket and equal bolt loading.

4. Leave the valve in the open position for hydrostatic test of the pipe work system before plant start up.

5. Hindle actuator bracketing is designed for valves fitted in horizontal pipe-work with the valve stem in the vertical position, when fitted otherwise it is the end users responsibility to ensure adequate support of the actuator is given to prevent any undue stress to the valve and ensure smooth operation.

5.0 Maintenance

5.1 Safety precautions

Restore the paint work of any components which have been damaged in transportation.

Valve
Before attempting any maintenance, ensure that the system has been de-pressurised and if necessary, drain off all dangerous chemicals.

General
Ensure that the valve is properly supported, if it is required to be taken out of the line use adequate lifting hooks and cables.

5.2 Cleansing methods

When corrective maintenance is being carried out on the valve, care must be taken to ensure no debris grease is present in the body housing. Degrease with Genklene or similar degreasing agent, in particular wipe all friction sealing contact surfaces with a clean cloth.

5.3 Routine maintenance

All Hindle valves have been designed to give long service life with little or no maintenance. Every six months the valve should be checked for correct working of main and associated components functioning.

5.4 Supa-Seal ball valves

5.4.1 Full bore valves 6” - 12” (3-piece) & reduced bore valves 8” - 16” (3-piece)

1.1 Stem seal and bearing maintenance

1. The stem seals can be replaced with the valve in or out of the line as required.

2. Remove the actuator/gearbox and mounting plate from the valve (if one is present).

3. Remove bonnet plate screws (23) allowing bonnet plate (7) to be removed.

4. Remove bonnet screws (24) and bonnet (3) with stem (5).

5. The exposed stem ‘o’ rings (31), gland ring (11) and graphite seals (30) can be prised from their housing using a small screwdriver or similar tool. Also remove packing ring (12).

6. The bonnet bore should be thoroughly cleaned prior to fitting new seals. New ‘o’ rings (31) should be installed and liberal application of silicone type grease applied to the sealing faces.

7. Before the stem is re-inserted into the bonnet, check the thrust bearing (19) and stem bearing (17) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing need replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressure (more than 50% maximum retake pressure).
8. The stem bearing (17) can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the bonnet housing adjacent to the split and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.

9. Prior to inserting the stem into the bonnet check the thrust bearing is adjacent to the back face of the stem. The stem may now be driven into the bonnet using a soft hammer.

10. Slide the packing ring (12), graphite seals (30) and gland ring (11), over the stem and push into the gland bore.

11. Fit a new bonnet ‘o’ ring (29) and fireseal (28) to the bonnet. Ensure the stem tongue and ball slot are correctly aligned and drive the bonnet assembly into the valve body (1). An application of silicone type grease around the bonnet seals will ease assembly.

12. Replace bonnet screws (24) and position the bonnet plate (7).

13. The bonnet plate screws (23) should be used to tighten the bonnet plate hard down onto the bonnet using a standard hexagon key.

14. Refit mounting plate and Actuator/Gearbox (If one is present).

1.2 Trunnion seal replacement

1. The trunnion seals can be replaced with the valve in or out of the line as requested.

2. Remove cover screws (25) and cover plate (8). A ball height adjustment screw (39) is fitted into the cover. This has been factory set and should only require re-adjustment if a new trunnion or ball is fitted.

3. Fit a new screw into the trunnion tapped hole and lever out the trunnion. The trunnion ‘o’ ring (36) and fireseal (35) can now easily be removed.

4. A trunnion thrust washer is fitted to carry the weight of the larger heavier balls. Before the trunnion is re-inserted check the thrust bearing friction surfaces. The low friction surface includes a sintered bronze inter-layer with PTFE impregnation. If for any reasons this has worn through to the steel backing, the thrust bearing need replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more. A new thrust washer should be fitted with the friction face towards the trunnion.

5. After cleaning the trunnion fit new seals. Apply a liberal coating of silicone type grease to the trunnion outer diameter and seals.

6. Drive the trunnion (6) back into the body (1) and ball (4). Do not drive the trunnion fully home, leave it proud of the body face.

7. Refit the cover plate (8) allow the cover to push the trunnion into position. Tighten the cover hard down with the cover screws (25) using a standard hexagon key.

1.3 Body adaptor joint replacement

1. In order to replace the body adaptor joints, the valve MUST be removed from the line.

2. Remove the adaptor nuts (22) and lift the adaptor from the body section.

3. The exposed body adaptor ‘o’ ring (27) and fireseal (26) can now be easily removed from the body adaptor.

4. Always fit a new graphite seal first to the adaptor followed by the ‘o’ ring. A liberal application of silicone type grease to the adaptor seals will aid assembly.

5. If further work is required to either the valve seats or ball follow the instructions in section 1.

6. If no further maintenance is required carefully lower the body adaptor into the body section by approximately 3/16” to 1/4” due to the spring load in the seats.

7. Position and evenly tighten down the adaptor using the body adaptor nuts (22).

8. Repeat procedure for second adaptor.

1.4 Seat replacement

1. In order to replace the seats the valve MUST be removed from the line.

2. Remove adaptor nuts (22) and lift the adaptor from the body.

3. Remove seat assembly (9) from adaptor. The seats are a relatively tight fit in their housing, due to the seal compression, it may therefore be necessary to push out the seats using a soft drift against the back of the seat ring (9A).

4. Inspect the springs (10) and grease if necessary.

5. Always assemble the fireseal (33), seat spacer (14) and seat plate (13) onto the seat (9A) before the ‘o’ ring (34).

6. A liberal application of silicone type grease should be applied to the seat outer diameter.

7. Inspect the body and adaptor housing bores for surface imperfections, corrosion, etc. Minor imperfections can be removed with fine wet and dry abrasive paper. Clean the bores thoroughly before applying a liberal coating of silicone type grease, then insert the seat assembly into the adaptor housing.

8. Position and evenly tighten down the adaptor using the body adaptor nuts (22).

9. Repeat procedure for second seat.
1.5 Ball and trunnion bearing replacement
1. To remove the ball, the bonnet, trunnion and adaptor, refer to section 1.1, 1.2 and 1.3 respectively.
2. Before the ball is re-installed into the body check the thrust washer(20) and trunnion bearing(18) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing need replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressure (more than 50% maximum rated pressure).
3. The bearing can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the trunnion housing, adjacent to the split, and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.
4. A new ball should always be fitted with a new bearing.
5. To refit the ball, lower it into the body section and align the trunnion and stem bores. Fit the trunnion bonnet and adaptors as detailed in sections 1.1, 1.2 and 1.3 respectively.
6. The replacement of a new ball or trunnion will necessitate adjustment of the ball adjustment screw as described in section 1.6.

1.6 Ball adjustment screw
1. Adjustment is only required if a new ball or trunnion is fitted.
2. Adjustment should be carried out with at least one adaptor removed.
3. Remove the adjustment screw lock screw(40) and loosen out the adjustment screw(39) approximately two full turns.
4. Knock the stem with a soft hammer until the ball is removed below the body centre-line. This can be checked with feeler gauges between the ball outer diameter and the body bore.
5. Carefully jack the ball back to the centre-line, again checking with feeler gauges.
6. Once the center position has been established replace the lock screw.
7. Adjustment is now complete.
5.4.2 Full bore valves 2” - 4” (2-piece) & reduced bore valves 3” - 6” (2-piece)

2.1 Stem seal and bearing maintenance
1. The line stem seals can be replaced with the valve in or out of the line as required.
2. Remove the Actuator/Gearbox and mounting plate from the valve (if one is present).
3. Remove bonnet screws (22) and bonnet (3) complete with stem (5) and gland (7).
4. The secondary gland screws (23) should be removed and the stem pushed out of the bonnet.
5. The exposed stem ‘o’ rings (31), gland ring (11) and graphite seals (30) can be prised from their housing using a small screwdriver or similar tool. Also remove packing ring (12).
6. The bonnet bore should be thoroughly cleaned prior to fitting new seals. New ‘o’ rings (31) should be installed and liberal application of silicone type grease applied to the sealing faces.
7. Before the stem is re-inserted into the bonnet, check the thrust bearing (19) and stem bearing (17) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing needs replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressure (more than 50% maximum rated pressure).
8. The stem bearing (17) can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the bonnet housing adjacent to the split and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.
9. Prior to inserting the stem into the bonnet check the thrust bearing is adjacent to the back face of the stem. The stem may now be driven into the bonnet using a soft hammer.
10. Slide the packing ring (12), graphite seals (30) and gland ring (11), over the stem and push into the gland bore.
11. Fit a new bonnet ‘o’ ring (29) and fireseal (28) to the bonnet. Ensure the stem tongue and ball slot are correctly aligned and drive the bonnet assembly into the valve body (1). An application of silicone type grease around the bonnet seals will ease assembly.
12. Replace bonnet screws (22) and tighten the bonnet hard down using a standard hexagon key.
13. Refit mounting plate and Actuator/Gearbox (If one is present).

2.2 Trunnion seal replacement
1. The trunnion seals can be replaced with the valve in or out of the line as requested.
2. Remove cover screws (24) and cover plate (8).
3. Fit a screw into the trunnion tapped hole and lever out the trunnion. The trunnion ‘o’ ring (37) and fireseal (36) can now be easily removed.
4. After cleaning the trunnion fit new seals. Apply a liberal coating of silicone type grease to the trunnion outer diameter and seals.
5. Drive the trunnion (6) back into the body (1) and ball (4). Do not drive the trunnion fully home, leave it proud of the body face.
6. Refit the cover plate (8) allow the cover to push the trunnion into position. Tighten the cover hard down with the cover screws (24) using a standard hexagon key.

2.3 Body adaptor joint replacement
1. In order to replace the body adaptor joints, the valve MUST be removed from the line.
2. Remove the adaptor nuts (21) and lift the adaptor from the body section.
3. The exposed body adaptor ‘o’ ring (27) and fireseal (26) can now be easily removed.
4. Always fit a new graphite seal first to the adaptor followed by the ‘o’ ring. A liberal application of silicone type grease to the adaptor seals will aid assembly.
5. If further work is required to either the valve seats or ball follow the instructions in section 2.4.
6. If no further maintenance is required carefully lower the body adaptor into the body section by approximately 3/16” to 1/4” due to the spring load in the seats.
7. Position and evenly tighten hard down the adaptor using the body adaptor nuts (21).

2.4 Seat replacement
1. In order to replace the seats the valve MUST be removed from the line.
2. Remove bonnet assembly and trunnion as described in section 2.1 and 2.2 respectively.
3. Remove adaptor nuts (21) and lift the adaptor from the body. Remove the Ball (4) from the body section.
4. Both seat assemblies (9) can now be removed. The seats are a relatively tight fit in their housing, due to the seal compression, it may therefore be necessary to push out the seats using a soft drift against the back of the seat ring (9A).
5. Inspect the springs (10) and grease if necessary.
6. Always assemble the fireseal (33), seat spacer (14) and seat plate (13) onto the seat (9A) before the ‘o’ ring (34).
7. A liberal application of silicone type grease should be applied to the seat outer diameter.
8. Inspect the body and adaptor housing bores for surface imperfections, corrosion, etc. Minor imperfections can be removed with fine wet and dry abrasive paper. Clean the bores thoroughly before applying a liberal coating of silicone type grease, then insert the seat assembly into the adaptor housing.
9. Insert the seat assemblies into the body and adaptor housing taking care.
10. Lower the cleaned ball onto the body seat and align the trunnion bore with the body bore.
11. Fit the adaptor (2), trunnion (6) and bonnet (3) as outlined in sections 2.3, 2.2 and 2.1 respectively.

2.5 Ball and trunnion bearing replacement
1. To remove the ball, the bonnet, trunnion and adaptor, refer to sections 2.1, 2.2 and 2.3 respectively.
2. Before the ball is re-installed into the body check the thrust washer (20) and trunnion bearing (18) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing needs replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressures (more than 50% maximum rated pressure).
3. The bearing can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the trunnion housing, adjacent to the split, and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.
4. A new ball should always be fitted with a new bearing.
5. To refit the ball, lower it into the body section and align the trunnion and stem bores. Fit the trunnion, bonnet and adaptors as detailed in sections 2.2, 2.1 and 2.3 respectively.

Fig. 3 - Reduced bore ball valve 3” - 6” TM 600, 900, 2500
Fig. 4 - Full bore ball valve 2” - 4” TM 600, 900, 2500
5.4.3 Full bore valves 8" - 16" (2-piece) & reduced bore valves 10" - 20" (2-piece)

3.1 Stem seal and bearing maintenance
1. The line stem seals can be replaced with the valve in or out of the line as required.
2. Remove the Actuator/Gearbox and mounting plate from the valve (if one is present).
3. Remove bonnet screws (24) and bonnet (3) complete bonnet ring (11) and stem (5).
4. The stem/bonnet ‘o’ rings (31), and graphite seals (30) can be prised from their housing using a small screwdriver or similar tool.
5. The bonnet bore should be thoroughly cleaned prior to fitting new seals. New ‘o’ rings (31) should be installed and liberal application of silicone type grease applied to the sealing faces.
6. Before the stem is re-inserted into the bonnet, check the thrust bearing (19) and stem bearing (17) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing needs replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressure (more than 50% maximum rated pressure).
7. The stem bearing (17) can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the bonnet housing adjacent to the split and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.
8. Prior to inserting the stem into the bonnet check the thrust bearing is adjacent to the back face of the stem. The stem may now be driven into the bonnet using a soft hammer.
9. Slide the graphite seals (30) over the stem and push into the bonnet bore.
10. Fit a new bonnet ‘o’ ring (29) and fireseal (28) to the bonnet. Ensure the stem tongue and ball slot are correctly aligned and drive the bonnet assembly into the valve body (1). An application of silicone type grease around the bonnet seals will ease assembly.
11. Replace bonnet screws (24) and tighten the bonnet hard down using a standard hexagon key.
12. Refit mounting plate and Actuator/Gearbox (if one is present).

3.2 Trunnion seal replacement
1. The trunnion seals can be replaced with the valve in or out of the line as requested.
2. Remove cover screws (25) and cover plate (8).
3. Fit a screw into the trunnion tapped hole and lever out the trunnion. The trunnion ‘o’ ring (36) and fireseal (35) can now be easily removed.
4. After cleaning the trunnion fit new seals. Apply a liberal coating of silicone type grease to the trunnion outer diameter and seals.
5. Drive the trunnion (6) back into the body (1) and ball (4). Do not drive the trunnion fully home, leave it proud of the body face.
6. Refit the cover plate (8) allow the cover to push the trunnion into position. tighten the cover hard down with the cover screws (25) using a standard hexagon Key.

3.3 Body adaptor joint replacement
1. In order to replace the body adaptor joints, the valve MUST be removed in from the line.
2. Remove the adaptor nuts (22) and lift the adaptor from the body section.
3. The exposed body adaptor ‘o’ ring (27) and gasket (26) can now be easily removed from the body adaptor.
4. Always fit a new gasket first to the adaptor followed by the ‘o’ ring. A liberal application of silicone type grease to the adaptor seals will aid assembly.
5. If further work is required to either the valve seats or ball follow the Instructions in section 2.4.
6. If no further maintenance is required carefully lower the body adaptor into the body section. The adaptor should be held off the body section by approximately 3/16” to 1/4” due to the spring load in the seats.
7. Position and evenly tighten hard down the adaptor using the body adaptor nuts (22).

3.4 Seat replacement
1. In order to replace the seats the valve MUST be removed from the line.
2. Remove bonnet assembly and trunnion as described in section 3.1 and 3.2 respectively.
3. Remove adaptor nuts (22) and lift the adaptor from the body. Remove the ball (4) from the body section.
4. Both seat assemblies (9) can now be removed. The seats are a relatively tight fit in their housing, due to the seal compression, it may therefore be necessary to push out the seats using a soft drift against the back of the seat ring (9A).
5. Inspect the springs (10) and grease if necessary.
6. Always assemble the fireseal (33), seat spacer (14) and seat plate (13) onto the seat (9A) before the ‘o’ ring (34).
7. A liberal application of silicone type grease should be applied to the seat outer diameter.
8. Inspect the body and adaptor housing bores for surface imperfections, corrosion, etc. Minor imperfections can be removed with fine wet and dry abrasive paper. Clean the bores thoroughly before applying a liberal coating of silicone type grease, then insert the seat assembly into the adaptor housing.
9. Insert the seat assemblies into the body and adaptor housing taking care.
10. Lower the cleaned ball on to the body seat and align the trunnion bore with the body bore.
11. Fit the adaptor (2), trunnion (6) and bonnet (3) as outlined in sections 3.3, 3.2 and 3.1 respectively.

3.5 Ball and trunnion bearing replacement
1. To remove the ball, the bonnet trunnion and adaptor, refer to sections 3.1, 3.2 and 3.3 respectively.
2. Before the ball is re-installed into the body check the thrust washer (20) and trunnion bearing (18) friction surfaces. The low friction surfaces include a sintered bronze inter-layer with PTFE impregnation. If for any reason this has worn through to the steel backing the bearing needs replacement. Bearing replacement should only become necessary if the valve has been subjected to 10,000 cycles or more at relatively high differential pressures (more than 50% maximum rated pressure).
3. The bearing can be removed by inserting a screwdriver (or similar) between the bearing outer diameter and the trunnion housing, adjacent to the split, and bending one half of the bearing inwards. It will then be possible to remove the bearing with a pair of grips. After cleaning the housing a new bearing can be pressed or drifted home.
4. A new ball should always be fitted with a new bearing.
5. To refit the ball, lower it into the body section and align the trunnion and stem bores. Fit the trunnion, bonnet and adaptors as detailed in sections 2.2, 2.1 and 2.3 respectively.

3.6 Ball adjustment screw
1. Adjustment is only required if a new ball or trunnion is fitted.
2. Adjustment should be carried out with at least one adaptor removed.
3. Remove the adjustment screw lockscrew (40) and loosen out the adjustment screw (39) approximately two full turns.
4. Knock the stem with a soft hammer until the ball is removed below the body center-line. This can be checked with feeler gauges between the ball outer diameter and the body bore.
5. Carefully jack the ball back to the center-line, again checking with feeler gauges.
6. Once the center position has been established replace the lock screw.

![Fig. 5 - Full bore ball valve 8" - 16" TM 150, 300](image1)

![Fig. 6 - Reduced bore ball valve 10" - 10" TMR 150, 300](image2)
5.5 Gearbox removal (when fitted)

5.5.1 Installation

- **Gearbox**
  The gearbox consists of a totally enclosed worm and wheel segment which rotates through 90° under the action of rotating the handwheel. Adjustable stops are incorporated to act on the segment ensuring any coupling discrepancies between valve and gearbox can be compensated for.
  Position of the valve when the gearbox operated, is indicated on the top of the gearbox with an indicating arrow. Clockwise rotation of the handwheel closes the valve, anti-clockwise rotation opens it.

5.5.2 Pre-commissioning

- **Operation**
  Gearbox operated valves are present at the factory to ensure correct operation. If full closure of the blade, or alignment when open is not achieved adjust stops on gearbox.
  (See Fig 7).
  1. Determine direction of adjustment, then loosen appropriate locknut (1).
  2. Tighten or loosen adjusting screw (2), by tightening the adjusting screw the angular stroke is reduced, loosening the adjusting screw the angular stroke is increased.

- **Protection (all codes)**
  Restore the paintwork of any components which have been damaged in transportation and assembly.

5.5.2 Maintenance

- **Maintenance schedule**
  No maintenance is required other than periodic inspection to ensure satisfactory operation to the valve.
  Valves where listed are fitted with an enclosed geared operator. It is recommended that at least once every year, if possible, the gearbox cover should be removed and grease added if necessary (for approximate grease see gearbox nameplate).

6.0 Fault finding

6.1 Failure to operate valve

In this case the ball will not rotate to complete its normal operational function.

- **Seats dirty**
  Cause - Abrasive particle embedded in the friction surface of the valve seats from dirty services or commissioning.

- **Seats deformed**
  Cause - Inaccurate stop position allowing ball to not fully control the PTFE seats, and so flowing of the seats occurs creating deformation.

- **Over compression of seats**
  Cause - Normally due to newly fitted seats which have not been embodied fully into the seat grooves
  Action - for (a), (b) & (c) fit new seat rings. Check valve ball to ensure no damage has occurred to ball, if ball is damaged replace the ball also.

6.2 External valve leakage

Due to the design of the valve, the only external leak path is via the gland.

- **Gland seal wear**
  Cause - Normal operation wear 100,000 plus cycles of the valve operation.
  Action - Remove old seals and replace with new ones.

- **Gland seals deformed**
  Cause - Misalignment in bracketing/adaptor mounting from operator causing side loading of stem.
  Action - Check gland seal to ensure no permanent damage, replace if necessary, re-align operator/valve mounting.

6.3 Through valve leakage

The valve does not seal in the closed position.

- **Seat ring wear**
  Cause - Normal operation wear 100,000 plus cycles of the valve operation.
  Action - Fit new seat rings.

- **Damaged seats**
  Cause - Scratching or grooved seats due to dirty nature of service.

- **Deformed seats**
  Cause - Inaccurate stop position as 6.1(b) but not as severe.
  Action - For (b) & (c) fit new seat rings. Check valve ball to ensure no damage has occurred to ball, if ball is damaged replace ball also.